

FIGURE 1 (Prior Art)

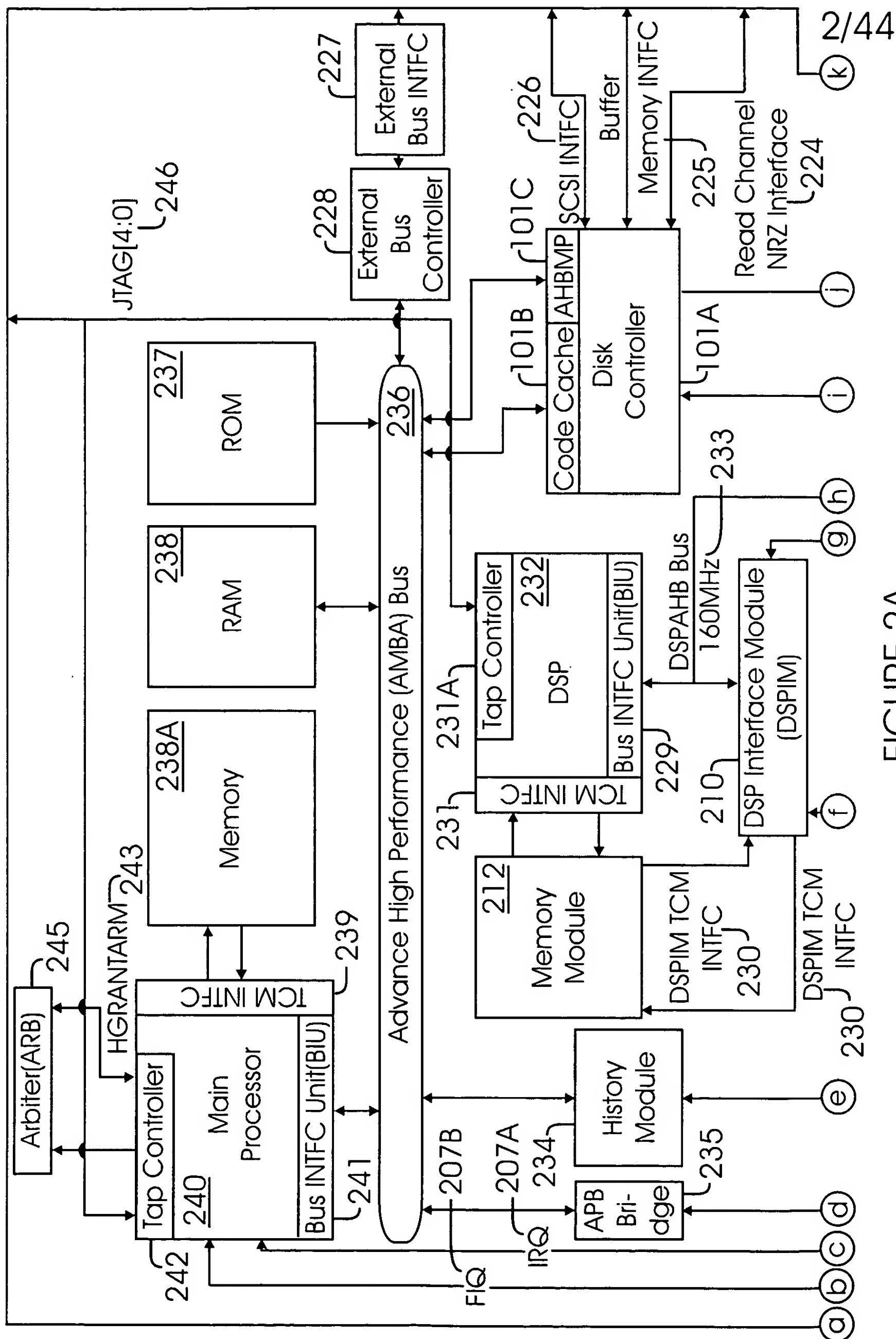


FIGURE 2A

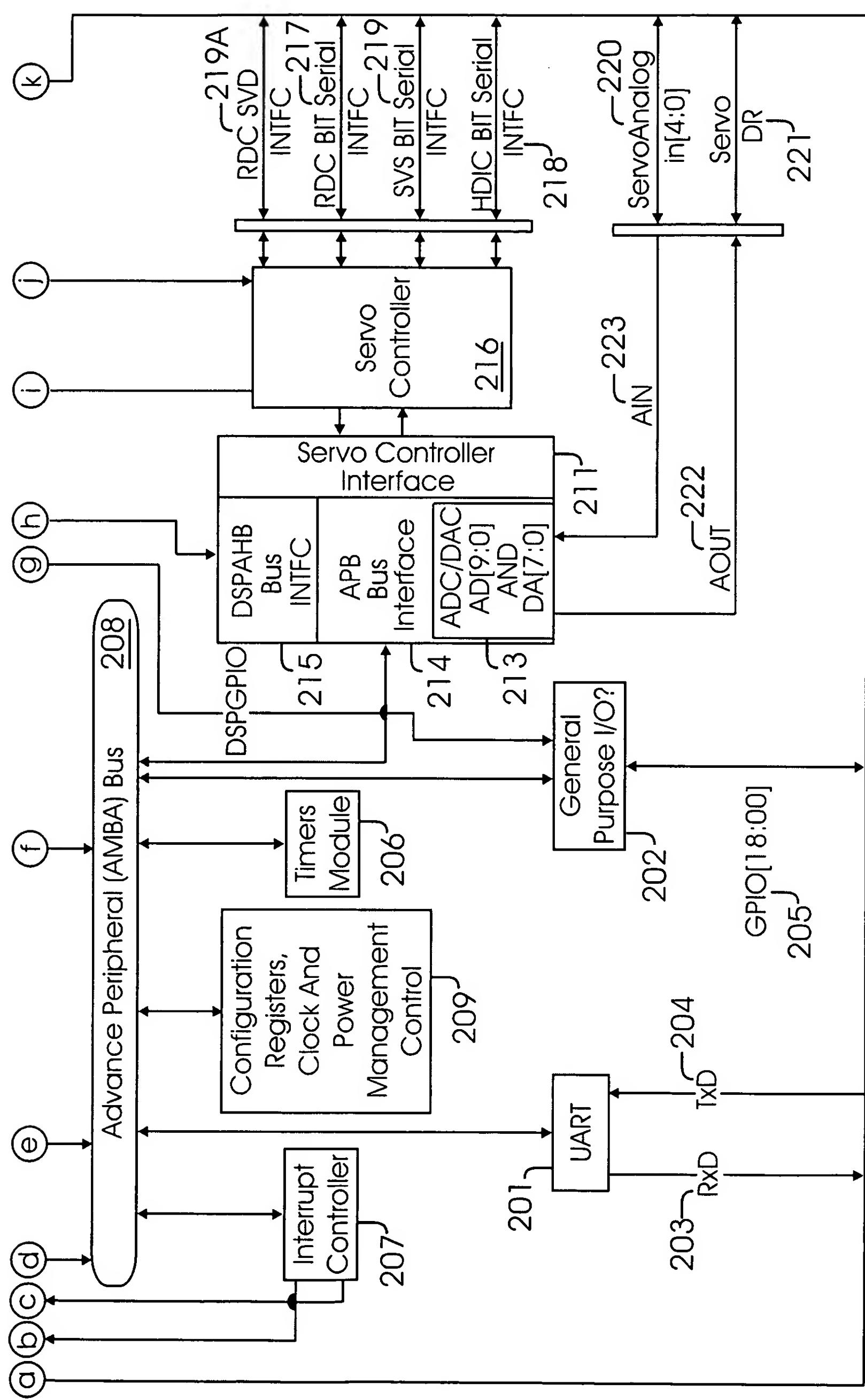


FIGURE 2B

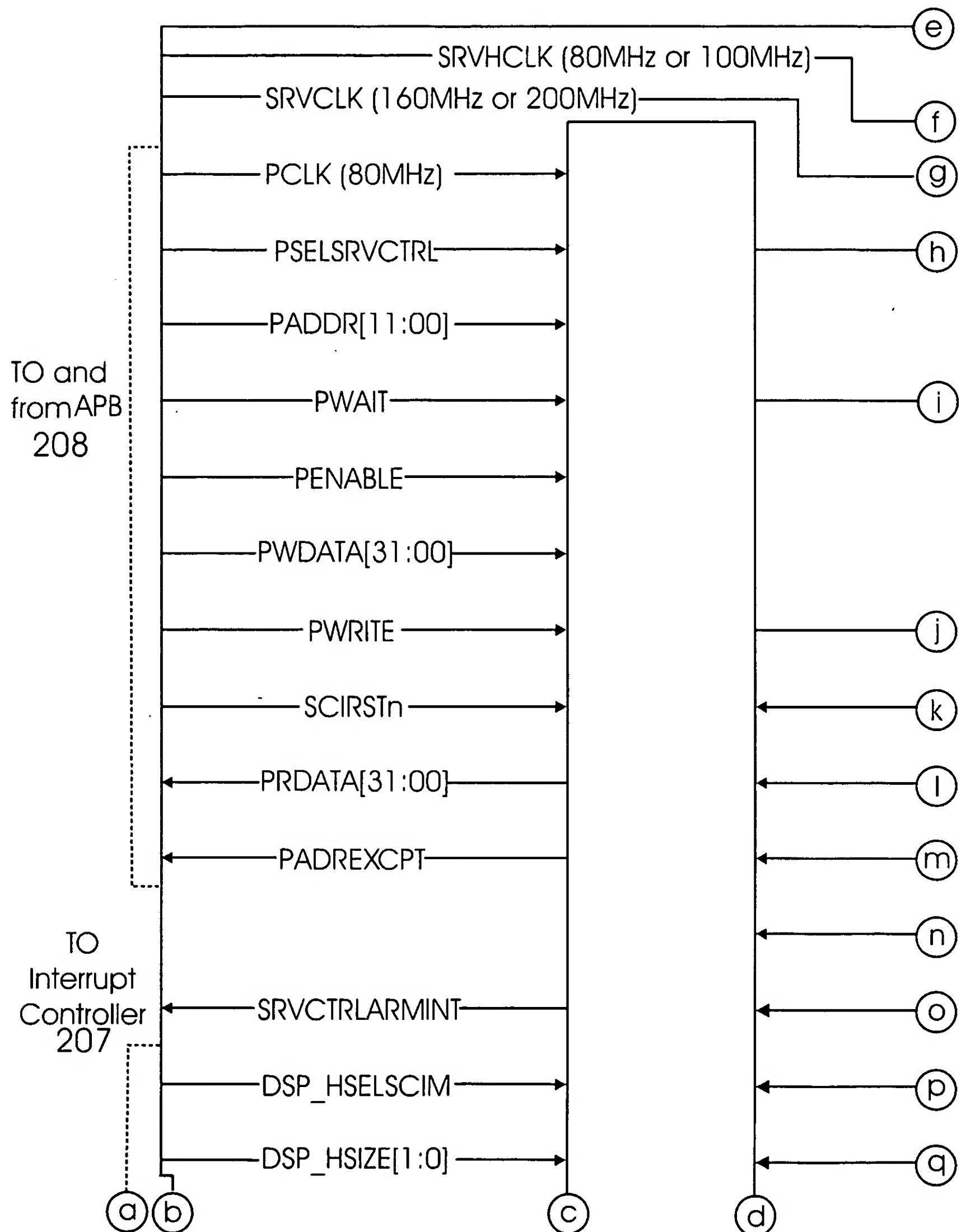


FIGURE 3-(i)

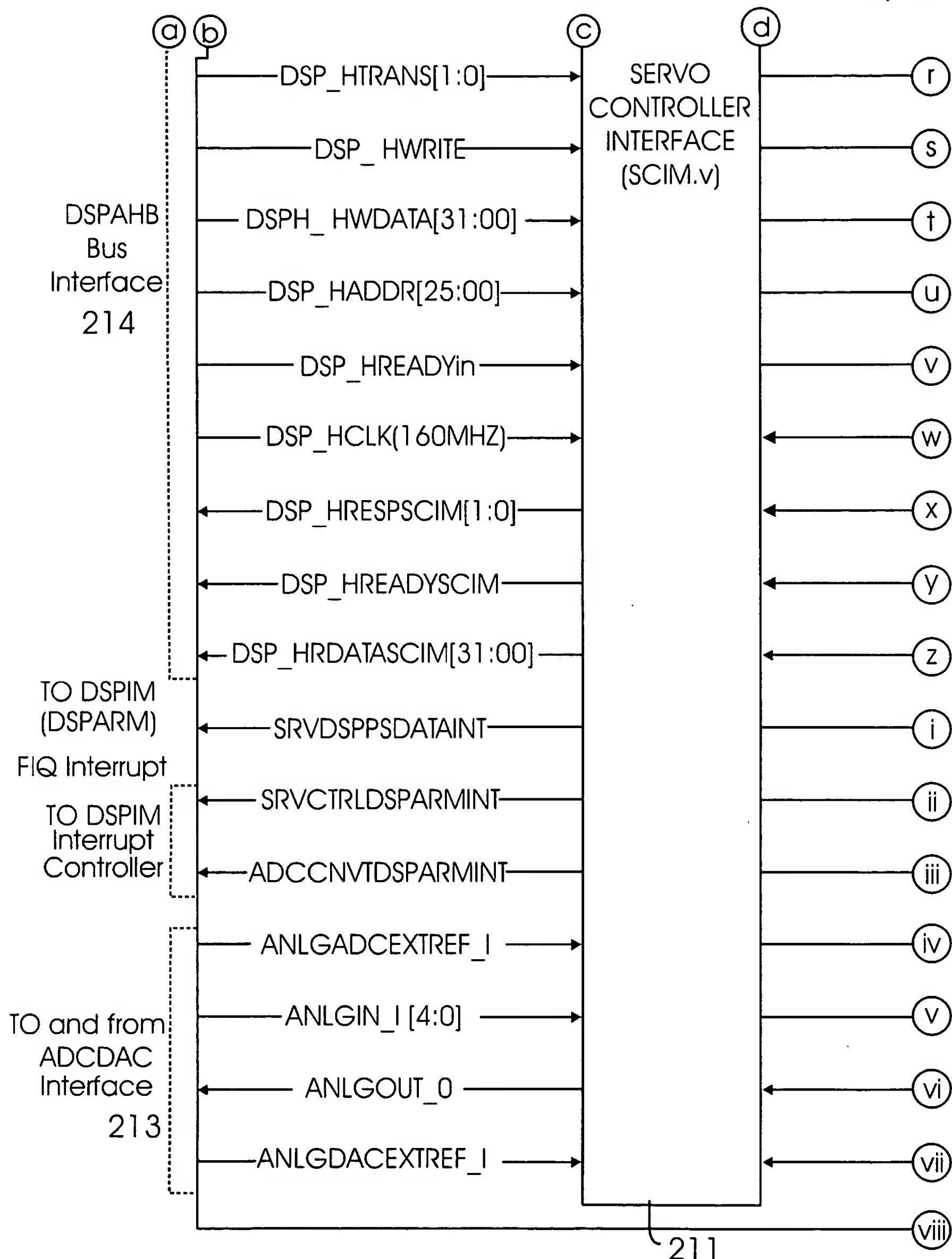


FIGURE 3-(ii)

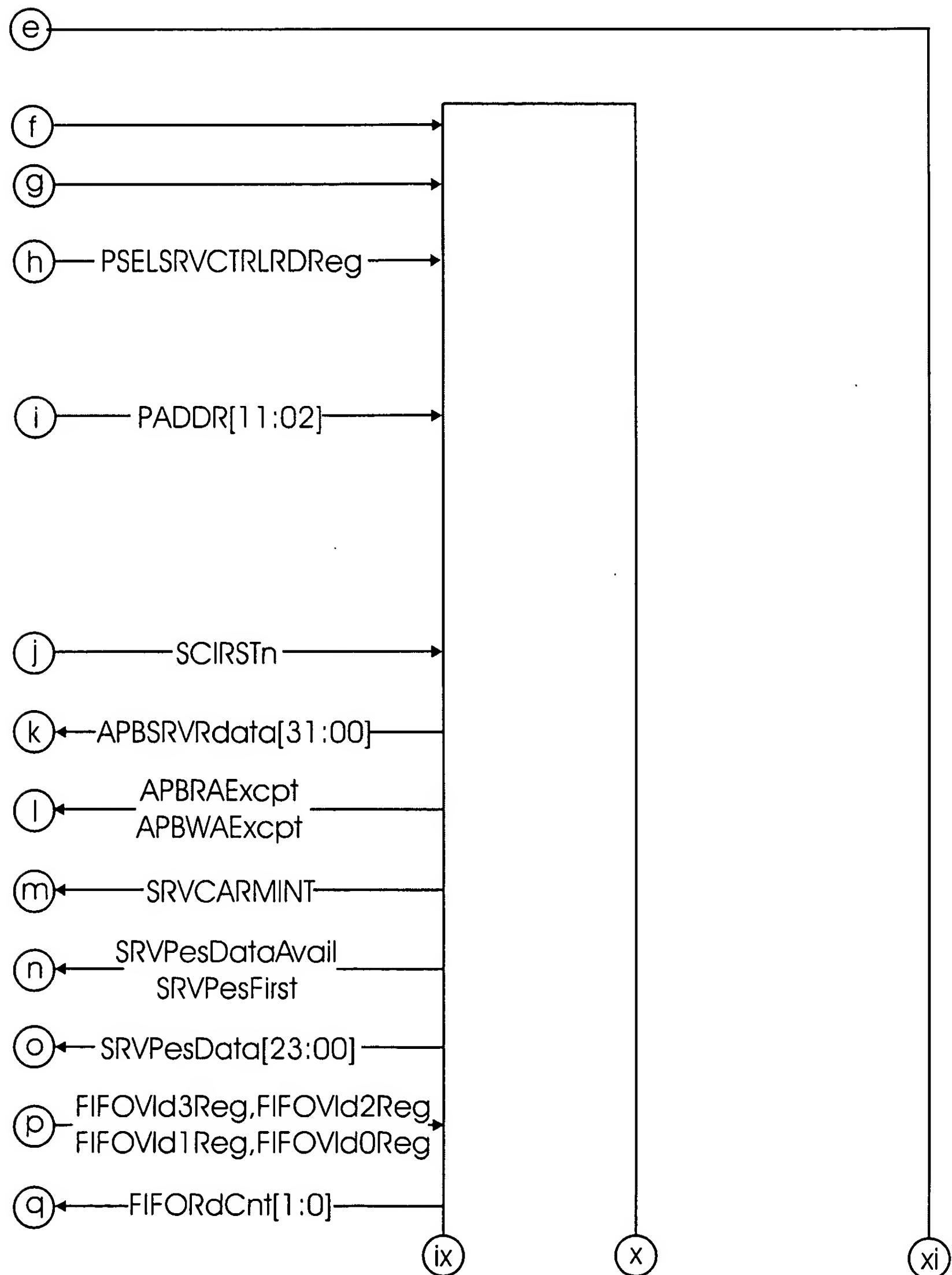


FIGURE 3-(iii)

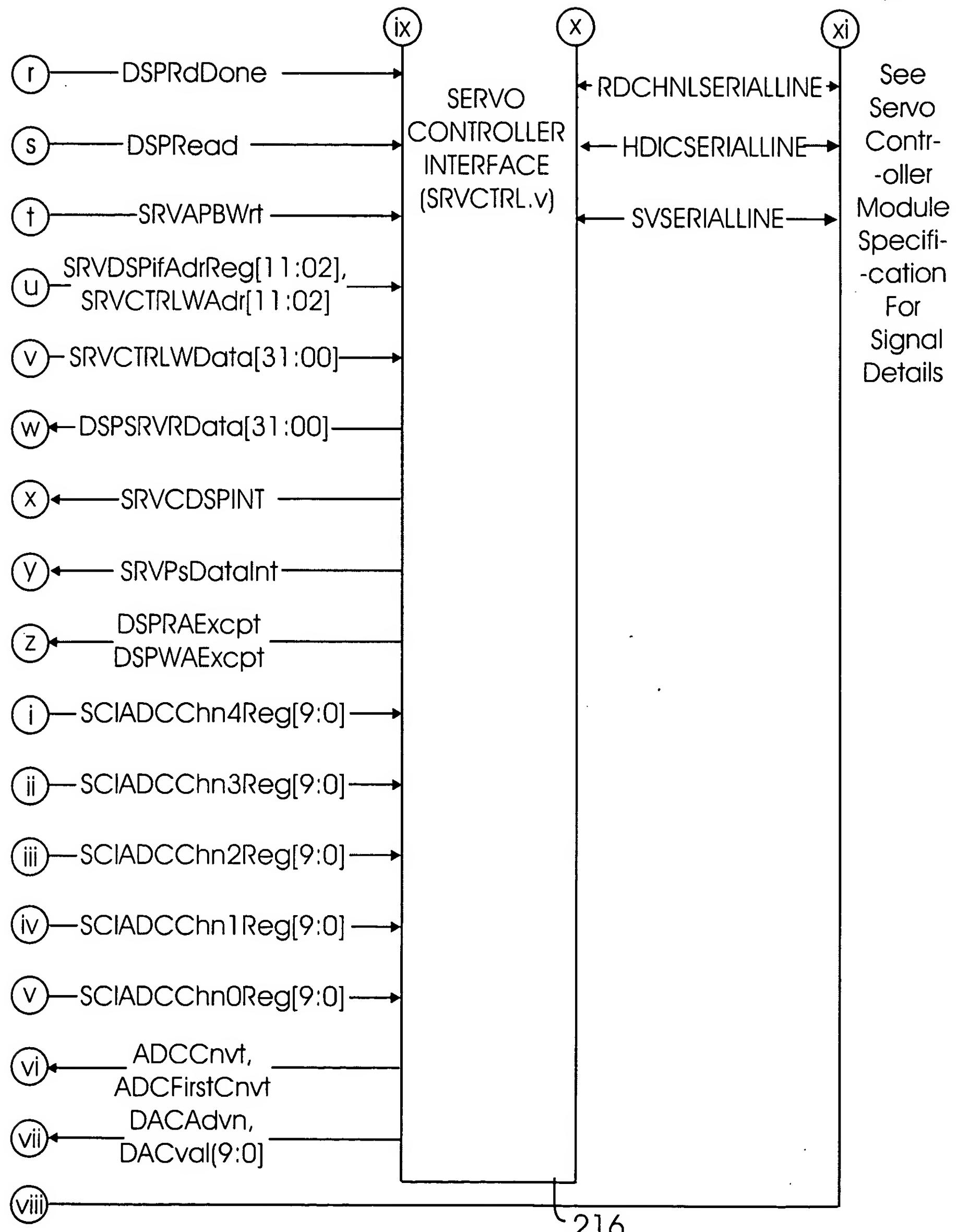


FIGURE 3-(iv)

Signal	Count	Description
PCLK	1	APB 208 Clock signal controls register loads and register reads associated with APB 208 transactions. All action in SCI 211 associated with APB 208 occurs on the low to high assertion of the PCLK signal.
SCIRSTn	1	APB 208 Reset or firmware reset signal is asserted active low when APB 208 is reset or when the firmware sets the MdlRstReg[07]. When this signal is asserted all registers in SCI 211 and SC 216 are cleared to a default reset value and interrupts are disabled.
PENABLE	1	APB 208 Enable signal is asserted high active for 1 clock cycle by APB Bridge 235 to enable all register access associated with APB interface 214 in SCI 211.
PSELSRVCTRL	1	This signal when asserted high indicates that APB Bridge235 has selected SCI 211 for an APB 208 transaction. One signal is provided for each APB 208 peripheral. This signal is asserted by APB Bridge 235 at the start of the transaction and remains asserted until the transaction is completed.
PADDR[11:00]	12	This is an APB 208 Address (for example, 12 bits) that is decoded by SCI 211 to select a local register or register during an APB Bridge 235 access. If the address is for SC 216, then SC 211 passes this address to SC 216. SCI 211 also validates the address. These signals are asserted by APB Bridge 235 at the start of the transaction and remains asserted until the transaction completes.
PWRITE	1	This is an APB208 Write signal that indicates a write transaction when asserted high and a read transaction when asserted low. This signal is asserted by APB Bridge 235 at the beginning of the transaction and remains asserted until the transaction is completed.
PWDATA[31:00]	32	These are APB 208 Write Data signals that are driven by APB Bridge 235 and when executing a write transaction provides the associated write data for these signals.

FIGURE 4A

Signal	Count	Description
PRDATA[31:00]	32	The APB 208 Read Data Signal:: When APB Bridge 235 selects SCI 211 and the PWRITE signal is asserted low, SCI 211 supplies the read data based on the decode of the PADDR[11:00]. When the read data is from SC 216,SC 211 synchronizes this signal to the 80MHz clock domain and drives bits 31:00 of APB 208 read data.
SRVCTRLARMINT	1	This is an Interrupt from SCI 211 to the Interrupt Controller 207 : SCI 211 synchronizes this signal to the 80MHz clock domain.
PWAIT	1	This APB 208 Bus Wait signal is asserted by SCI 211 to indicate to APB Bridge235 that it cannot complete the requested read transaction in two bus cycles . To insert a wait state this signal is asserted before APB Bridge 235 asserts PENABLE . When the signal is de-asserted (synchronous with PCLK), APB Bridge 235 asserts PENABLE on the subsequent PCLK.
PADREXCPT	1	This indicates an APB 208 Address Exception. It is asserted high for one PCLK clock cycle when SCI 211 detects an APB 208 "address exception" .

FIGURE 4B

Signal	Count	Description
DSP_HRDATA[31:00]	32	The Servo Controller Interface Read Data signals are used to transfer read data from SCI 211 to the requesting bus master (DSP 232) through the Slave To Master Multiplexer (not shown) of the DSPAHB Bus 233.
DSP_HRESPSCIM[1:0]	2	This signal provides a Servo Controller Interface Response. When SCI 211 is selected to respond to a bus master (DSP 232) then SCI 211 indicating the status of the requested bus transaction it has completed controls the signals.These signals are returned to the bus master through the Slave To Master Multiplexer (not shown) of the DSPAHB Bus 233.
DSP_HREADYout	1	Servo Controller Interface HREADY out signal: When SCI 211 is selected to respond to a bus master(DSP 232) , SCI 211 asserts this signal indicating to the bus master that it has completed the requested bus transaction . This signal is returned to the bus master through the Slave To Master Multiplexer of the DSPAHB Bus 233.

FIGURE 5B

Signal	Count	Description
DSP_HCLK	1	This is the DSPAHB Bus 233 clock signal that controls register loads; status reads and synchronizes bus transactions to DSP 232(that acts a bus-master). All action with the DSPAHB Bus 233 in SCI 211 occurs on low to high assertion of this clock.
DSP_HSELSCIM	1	This signal is asserted by DSPAHB Bus 233 Address Decoder Module decoding the most significant 6 bits of the DSPAHB Address (DSP_HADDR[31:26]) which selects the assigned address space, for SCI 211 and SC 216.
DSP_HTRANS[1:0]	2	This DSPAHB Bus Transfer signal indicates the type of transfer a current DSPAHB Bus 233 transaction is executing (NONSEQUENTIAL , SEQUENTIAL , IDLE or BUSY). SCI 216 uses this information to determine the transfer type and the Response (AHBHRESP[1:0]) that will be returned to Bus 233.
DSP_HWRITE	1	This DSPAHB Write signal specifies whether the DSPAHB Bus 233 transaction is a read (DSP_HWRITE = 0) access or a write (DSP_HWRITE = 1) access.
DSP_HADDR[25:00]	26	This signal indicates the DSPAHB Address. The 26 bits of the DSPAHB Bus 233 address specify the memory mapped register 1209 or a memory location in SCI 211 or SC 216 bus master (DSP 232) is accessing.
DSP_HWDATA[31:00]	32	This DSPAHB Write Data [31:00] signal transfers the data from the DSPAHB Bus 233 master to SCI 211 during a write (store) transaction. SCI 211 registers these signals and either writes to a local register with this data or transfers the data to SC 216.
DSP_HSIZEx[1:0]	2	The DSPAHB Bus Size signal specifies the size of a transfer, i.e., byte, half word, or word. Byte = 00b: Halfword = 01b:Word = 11b.
DSP_HREADYin	1	The DSPAHB Bus Ready In signal indicates that a DSPAHB Bus 233 transaction has completed and a new transaction is starting. SCI 211 uses the assertion of this signal to enable loading the address and control information (DSPAHB Address,DSPAHB Size, DSPAHB Transfer, DSPAHB Write and DSPHSELSRVCTRL).

FIGURE 5A

FIGURE 6

Signal	Count	Description
SRVCTRLDSPMINT	1	Servo Controller DSP 232 Interrupt- This signal, if enabled, is asserted as a level sensitive interrupt to APBDSP Interface (DSPIRQ[0]) 214 indicating that an exception has occurred in SCI 211 or SC 216 due to an action by DSP 232. To determine the source of the exception, the SCIDSPARMStatusReg is interrogated.
SRVDSPPSDATAINT	1	Servo Controller DSP Positioning Data Available Interrupt signal if enabled, is asserted as an edge sensitive interrupt (one DSP_HCLK clock cycle pulse) to DSP 232 FIQ input indicating that SC 216 has error positioning information available for processing.
ADCCNVTDSPMINT	1	ADC Conversion Complete Interrupt to DSP 232 signal, if enabled is asserted as an edge sensitive interrupt (one DSP_HCLK clock pulse) to the DSP Interrupt Controller in the DSP Interface Module 210 indicating that SCI 211 has ADC (analog to digital) conversion information available for processing.

Signal	Count	Description
PRESETn (directly from APB Bridge 235)	1	APB 208 Reset signal is asserted active low when APB 208 is reset. When this signal is asserted all registers in SCI 211 and SC 216 are cleared to a default reset value and interrupts are disabled. SC 216 synchronizes this signal to its clock domain.
PSELsrvCTRUDReg	1	Servo Controller Read from APB 208- This signal is asserted by SCI 211 when an APB 208 read transaction is requested. This signal is synchronized by SC 216 to its clock domain and SC 216 based on PADDR[1:02], takes a "snapshot" of the contents of the accessed register or supplies the data of the accessed static register to SCI 211. If SC 216 takes a "snapshot" of the contents of a dynamic register then SC 216 supplies stable data to SCI 211.
PADDR[1:02]	10	APB Address. These 10 bits are APB 208 address. SCI 211 decodes these 10 bits to select a local register in SCI 211 or SC 216 register during an APB Bridge235 transaction. If the access is a read transaction SCI 211 passes these signals on to SC 216 to select the contents of the specified register. SC 216 using PSELsrvCTRUD synchronizes these signals to SC 216 clock domain. These signals remain asserted until the read transaction has completed on APB 208.

FIGURE 7

FIGURE 8

Signal	Count	Description
FIFOId0Reg	4	Write FIFO Entry x [3:0] Valid Signals - When SCI 211 asserts one of these signals entry x is valid ready for SC 216 to write the addressed register . SCI 216 asserts this signal for 2 DSP_HCLK (160MHz) clock cycles.
FIFOId1Reg		
FIFOId2Reg		
FIFOId3Reg		
SRVCTRLWAdr[9:0]	10	FIFO Entry Write Address specifies the memory mapped register that SCI 211 is writing in SC 216. SCI 211 validates this address before passing it on.
SRVCTRLWData[31:0]	32	FIFO Entry Write Data signals are associated with the write data address, SRVCTRLWAdr[9:0], that specifies the memory mapped register 1209 in SC 216 that SCI 211 is writing to.
SRVAPBWrt	1	Servo APB Write signal Specifies the interface which generated the write entry in the Speed Matching Write FIFO 1206. SC 216 use this information to route "write address exceptions" back to the initiating interface in SCI 211.SRVAPBWrt = 0 = Auxiliary Register Interface. SRVAPBWrt = 1 = APB write.

Signal	Count	Description
FIFORdCnt[1:0]	2	FIFO Read Count signal selects the FIFO (1206) entry that SC 216 is reading the address and writing data from.

FIGURE 9

Signal	Count	Description
DSPRead	1	DSP Read access request - When this signal is asserted (high) DSP 232 is requesting a read of a SC 216 memory mapped register (1209) specified by DSP_HADDR[11:02]. This signal remains asserted until the read transaction is completed.
DSPRdDone	1	DSP Read Done - SCI 211 asserts this signal for 1 DSP_HCLK clock cycle indicating that DSP 232 read will complete this cycle.
SRvDSPIfAdrReg[11:02]	10	DSPARM Interface Address Register- The contents of this register specifies the address of the memory-mapped register(1206) that DSP 232 is accessing in SC 216. SCI 211 validates this address before passing it on.

FIGURE 10

Signal	Count	Description
APBSRV/Rdata[31:00]	32	APB Servo Controller Read Data is the read data from SC 216 to SCI 211 based on the decode of the PADDR[11:02] signal. SCI 211 synchronizes this data to the PCLK domain and loads APBSRV/RdReg[31:00] which drives PRDATA[31:00] to APB 208.
DSPSRV/Rdata[31:00]	32	DSPARM Servo Controller Read Data is the read data from SC 216 to SCI 211 based on the decode of SRVDSPIfAdrReg[11:00] signal. SCI 211 synchronizes this read data to the DSP_HCLK domain and loads SRVRDataReg[31:00] which drives DSP_HRDATA[31:00] to DSP 232.
SRVCARMINT	1	Servo Controller ARM Interrupt signal is a level sensitive interrupt from SC 216 when routing an interrupt to processor 240. This signal is synchronized to the SCI clock domain (DSP_HCLK).
SRVCDSPINT	1	SC 216 when routing an interrupt to DSP 232 asserts this interrupt signal. SCI 211 synchronizes this level sensitive signal to the DSP_HCLK domain. This interrupt is asserted for exceptions that are routed to DSP 232 with the exception of the positioning data interrupt (SRVPsDataInt) from the Read Channel.
SRVPsDataInt	1	SC 216 asserts this Servo Positioning Data Interrupt signal for two clock cycles when the Servo Mechanism position data is available from the Read Channel. SCI 211 synchronizes this signal to the DSP 232 clock domain(DSP_HCLK) while generating the interrupt.

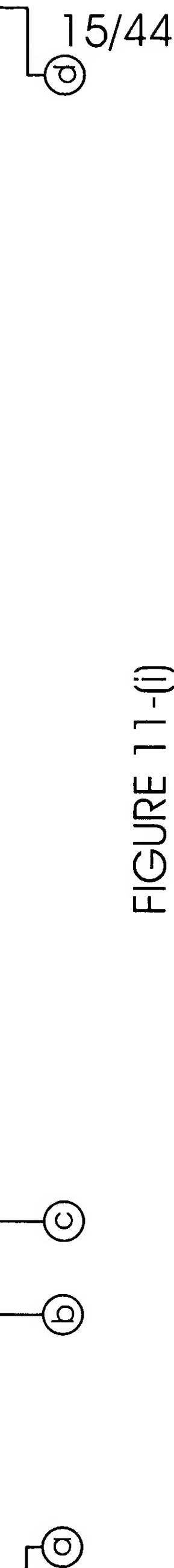


FIGURE 11-(i)

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(a)		
(b)		
(c)		
(d)		
APBRAExcpt	1	This APB 208 Read Address Exception signal occurs when SC 216 detects an address exception on an APB 208 read transaction. SC 216 asserts this signal and captures this signal and asserts the PADREXCPT signal to APB Bridge 235.
APBWAEExcpt	1	This APB 208 Write Address Exception occurs when SC 216 detects an address exception on an APB 208 write transaction. SC 216 asserts this signal for two (SRVCLK) clock cycles. SC 211 captures this signal and asserts the PADREXCPT signal to APB Bridge 235.
DSPRAExcpt	1	The DSP 232 Read Address Exception occurs when SC 216 detects an address exception for a DSP 232 read transaction. SC 216 asserts this signal for two (SRVCLK) clock cycles. SC 211 captures this signal and generates an interrupt to DSP 232.
DSPWAEExcpt	1	DSPARM Write Address Exception - SC 216 detects an address exception on a DSP 232 write transaction. SC 216 asserts this signal for two (SRVCLK) clock cycles. SC 211 captures this signal and generates an interrupt to DSP 232.

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FIGURE 11-(ii)

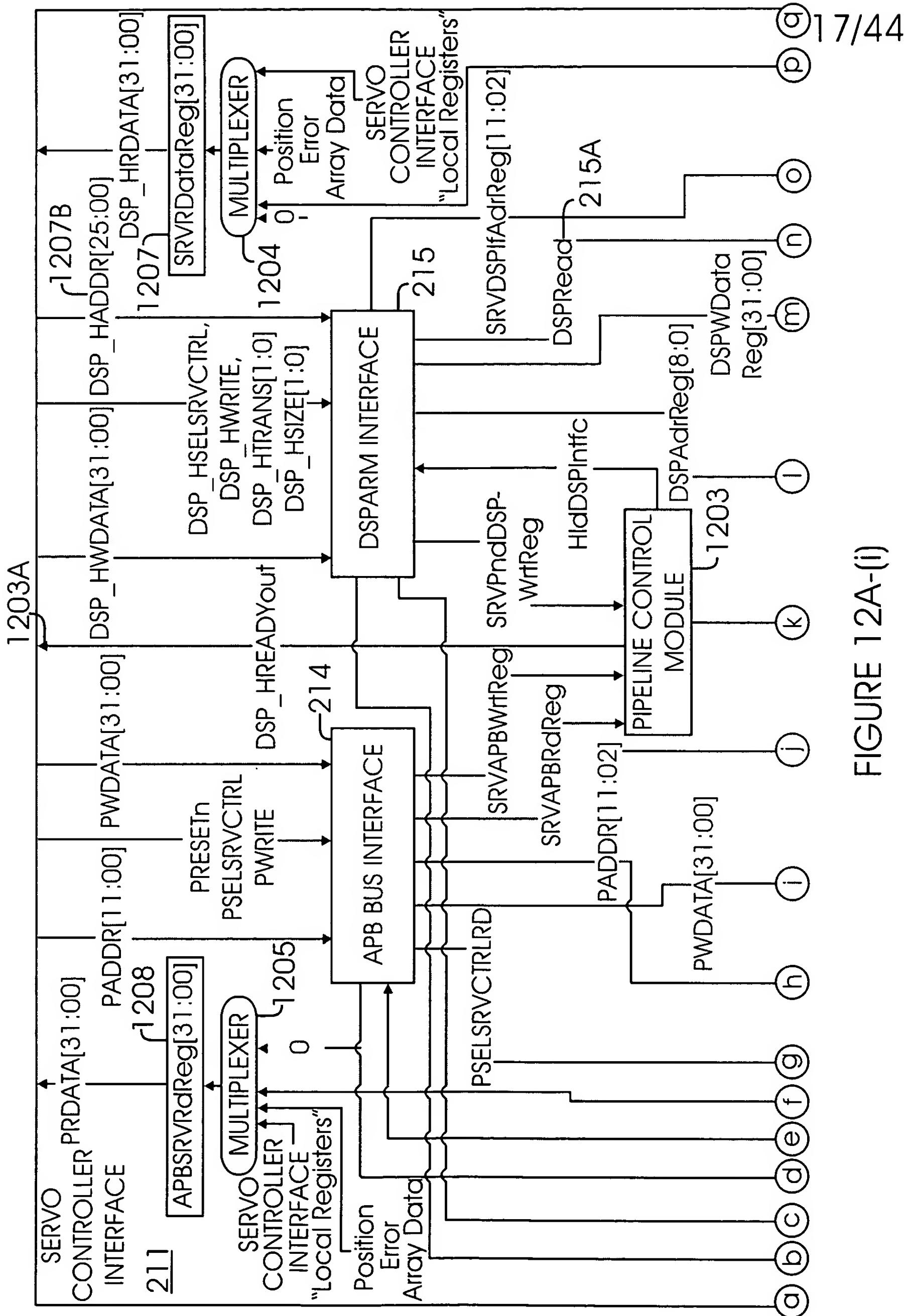


FIGURE 1 2A-(i)

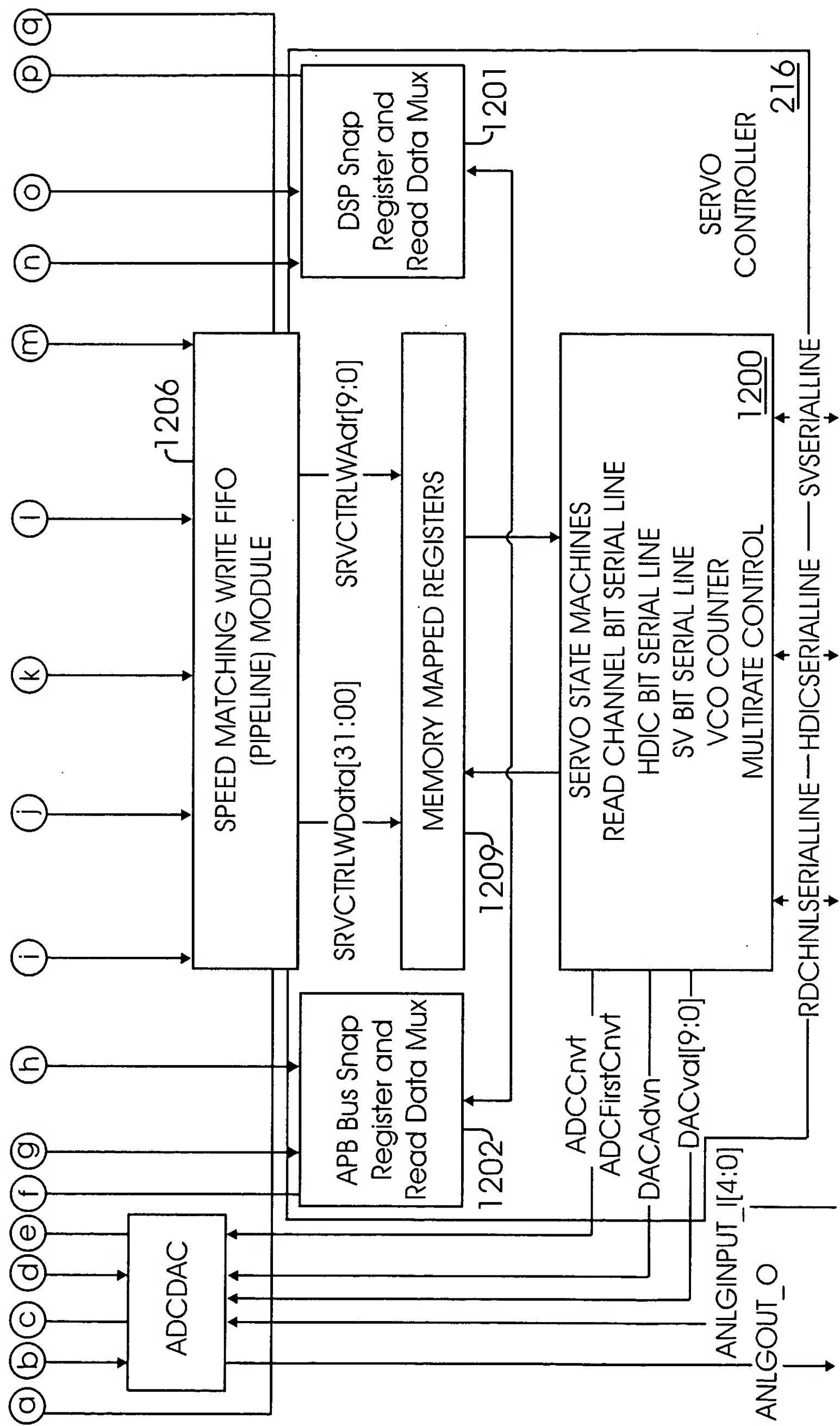


FIGURE 12A-(ii)

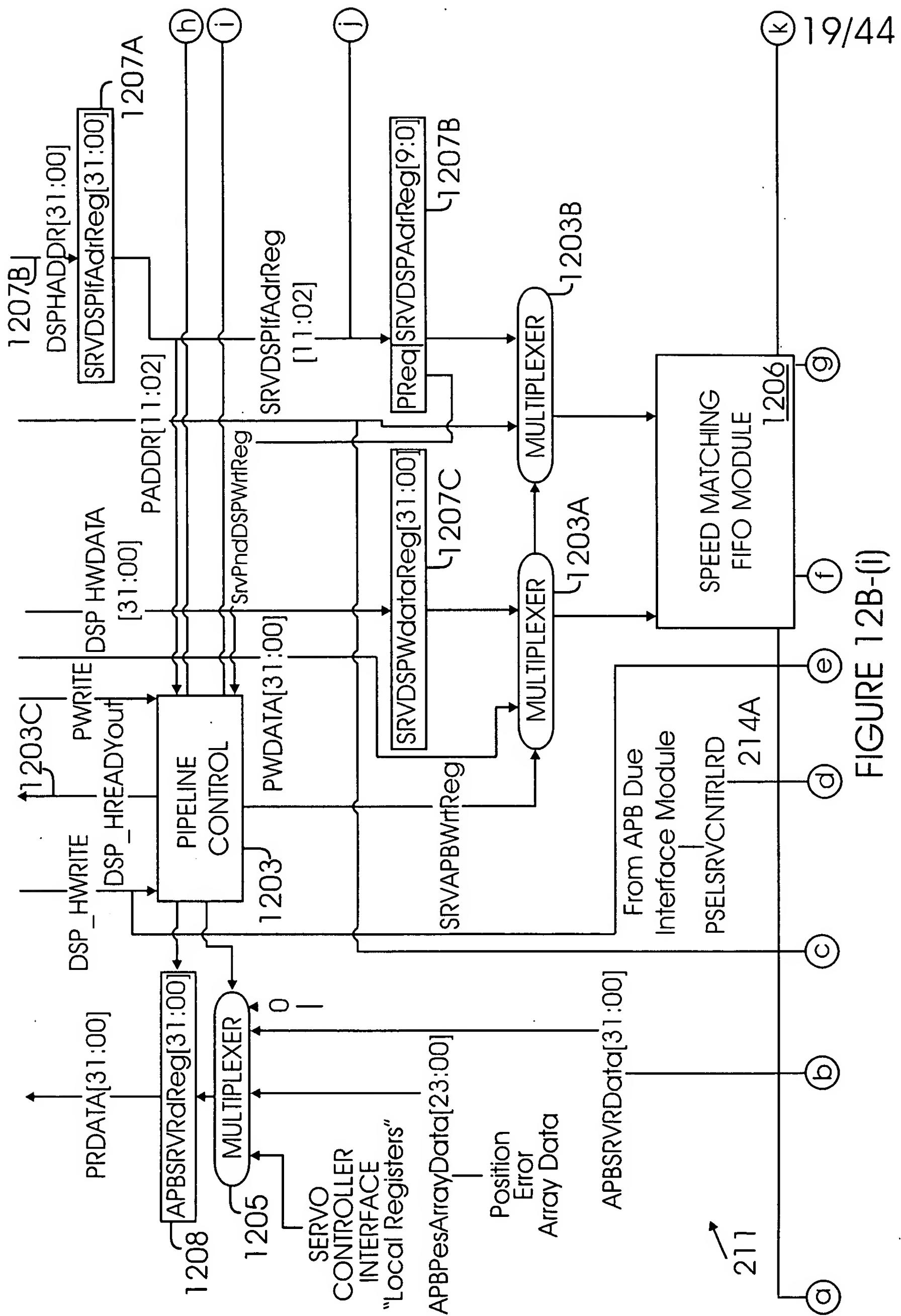
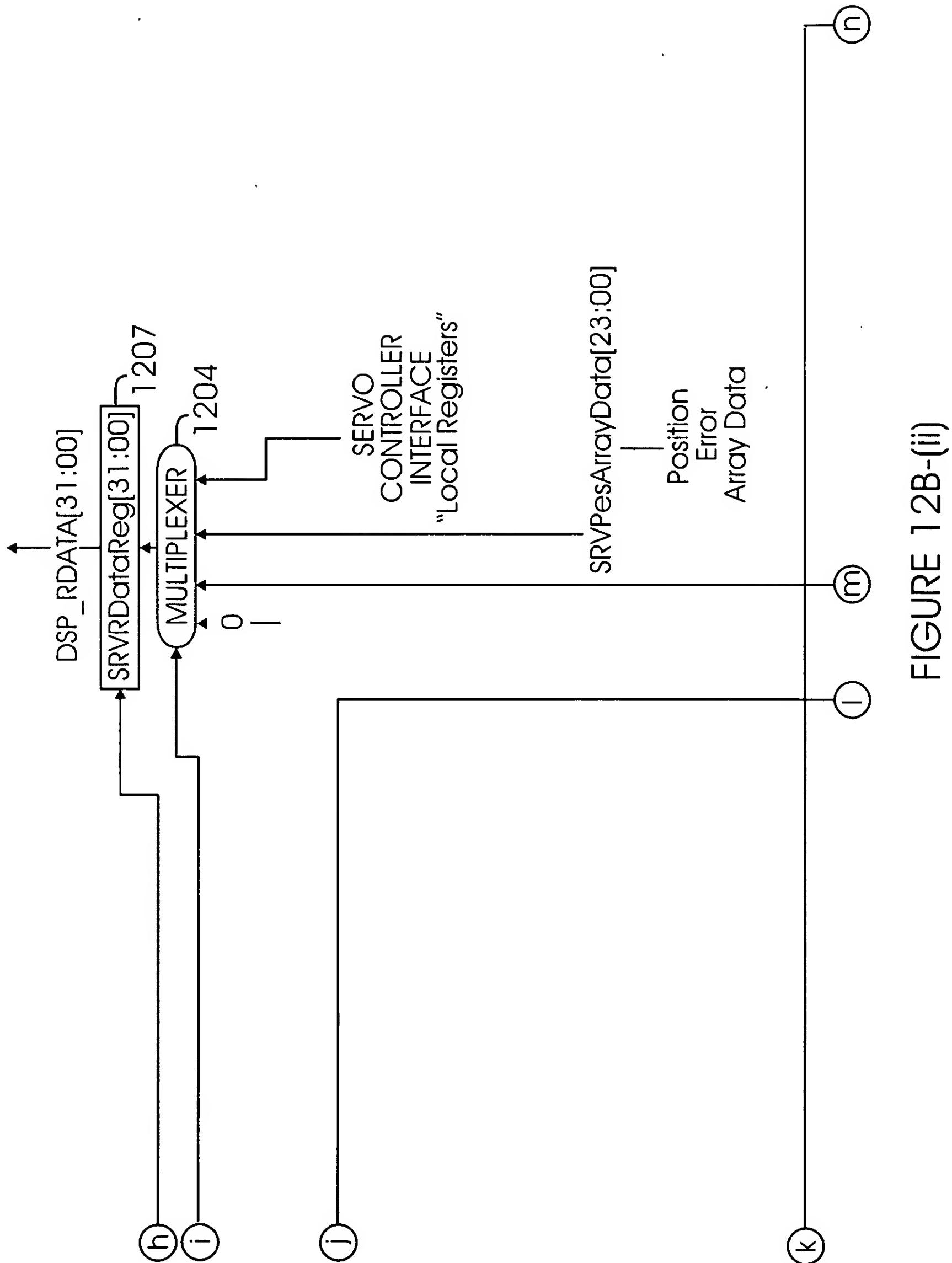


FIGURE 12B-(i)



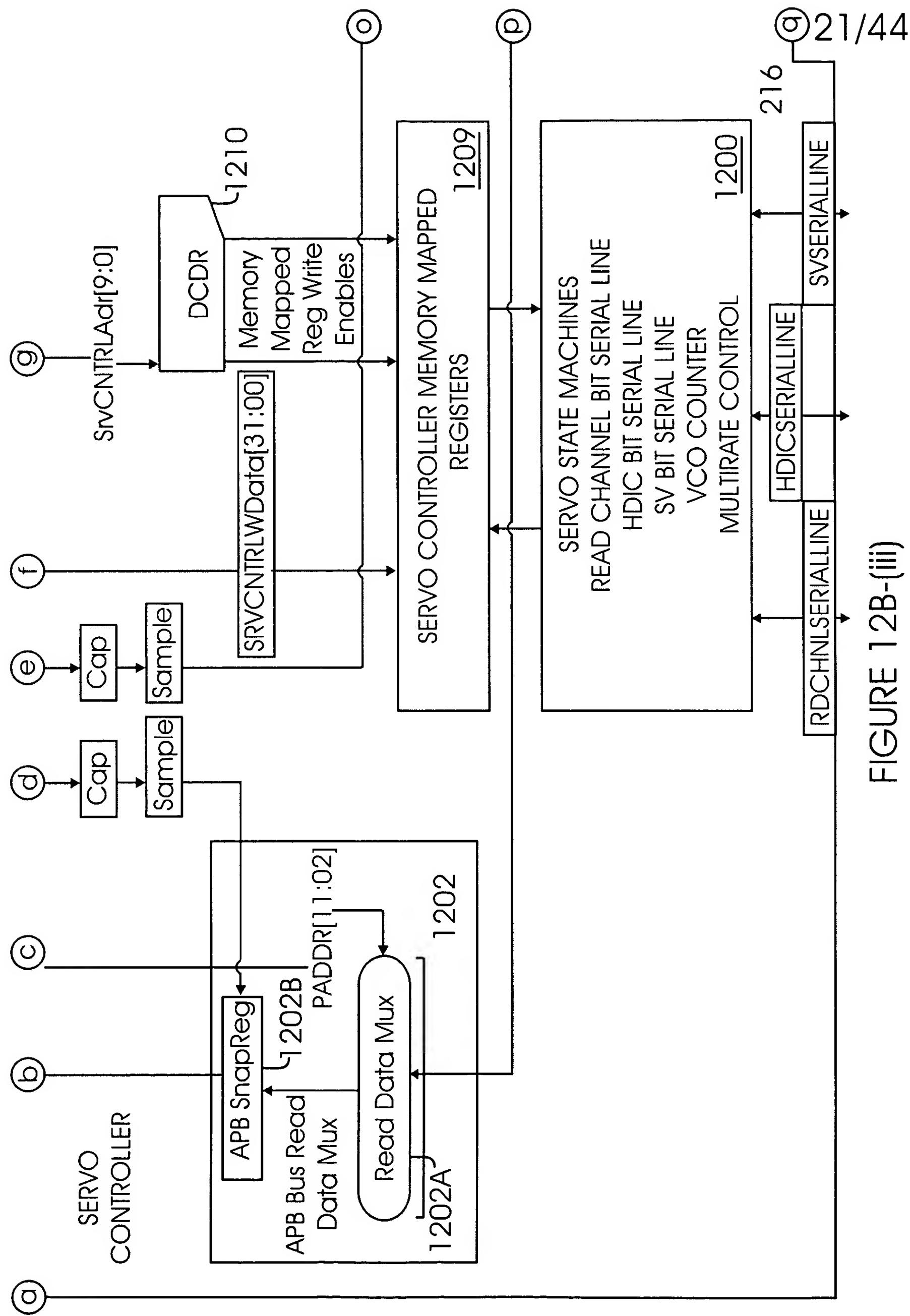


FIGURE 12B-(iii)

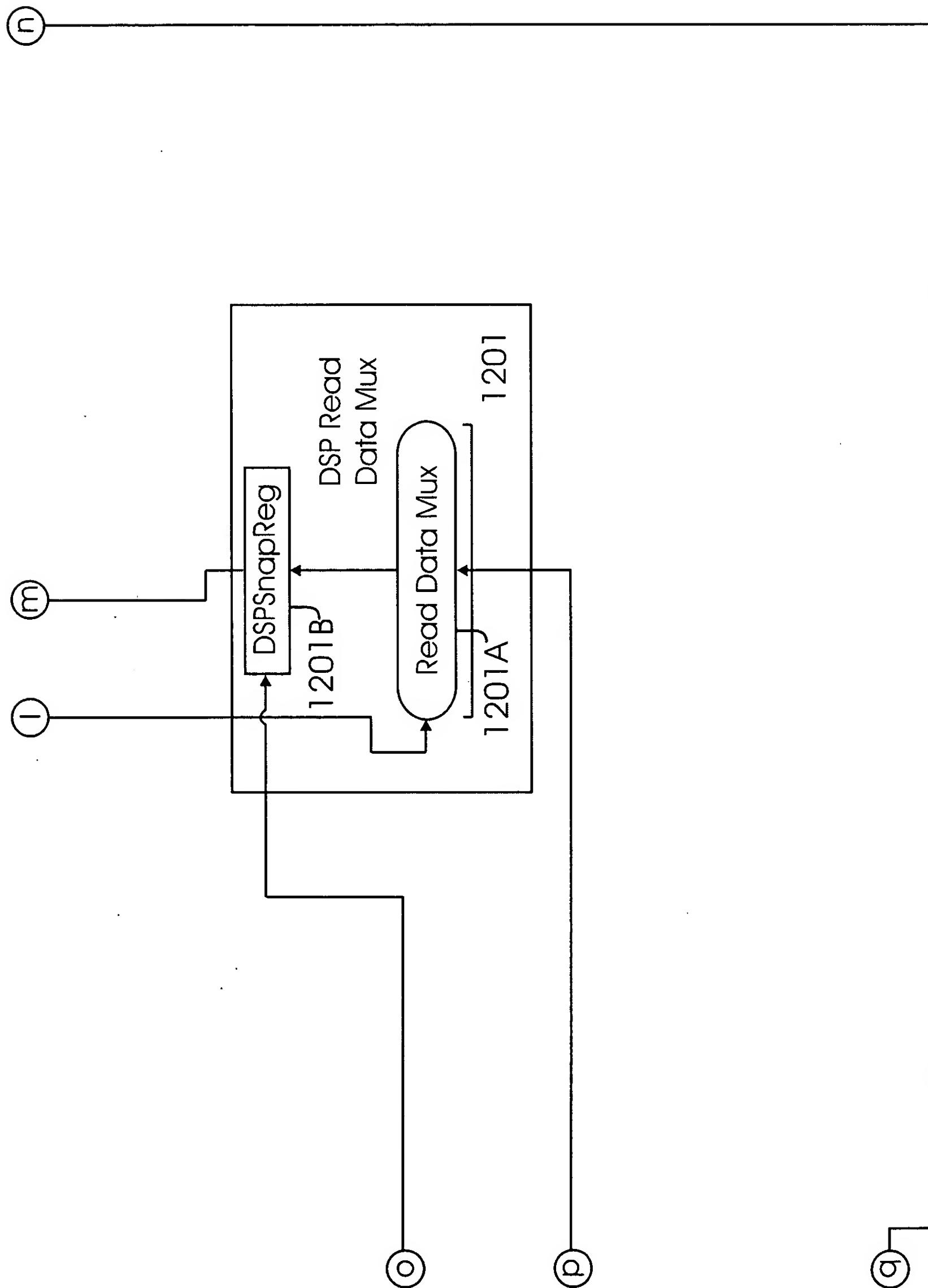


FIGURE 12B-(iv)

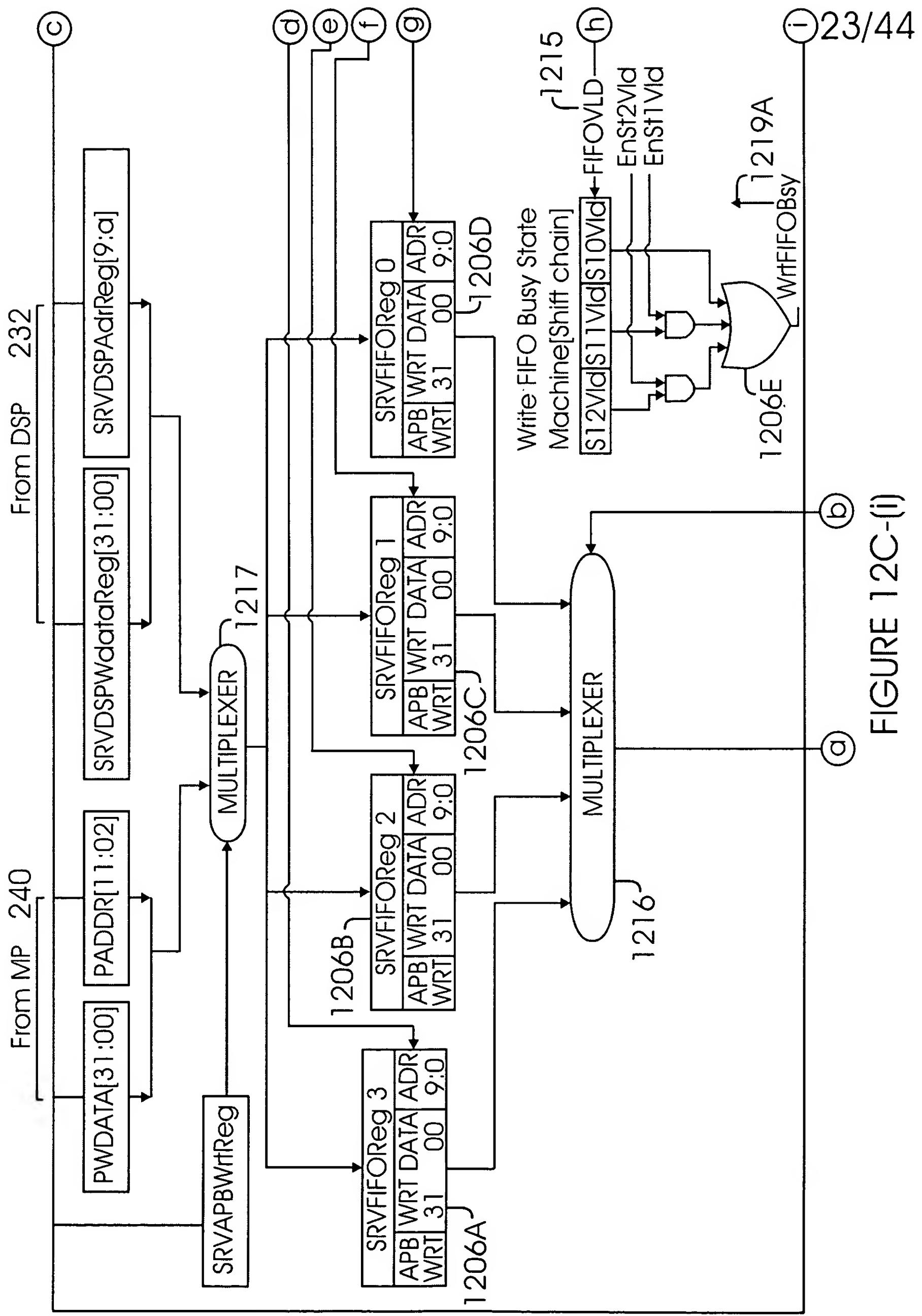


FIGURE 12C-(i)

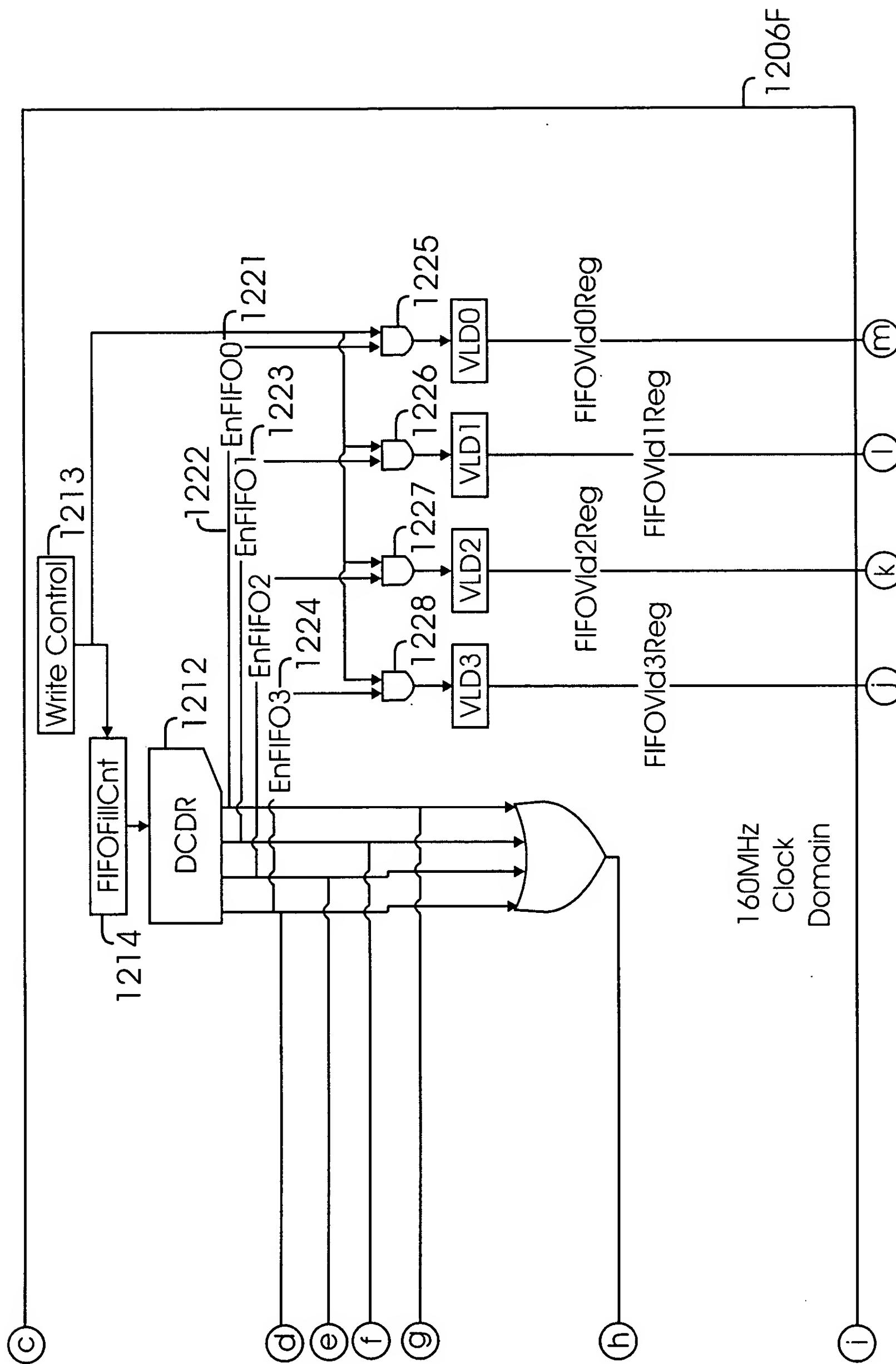


FIGURE 12C-(ii)

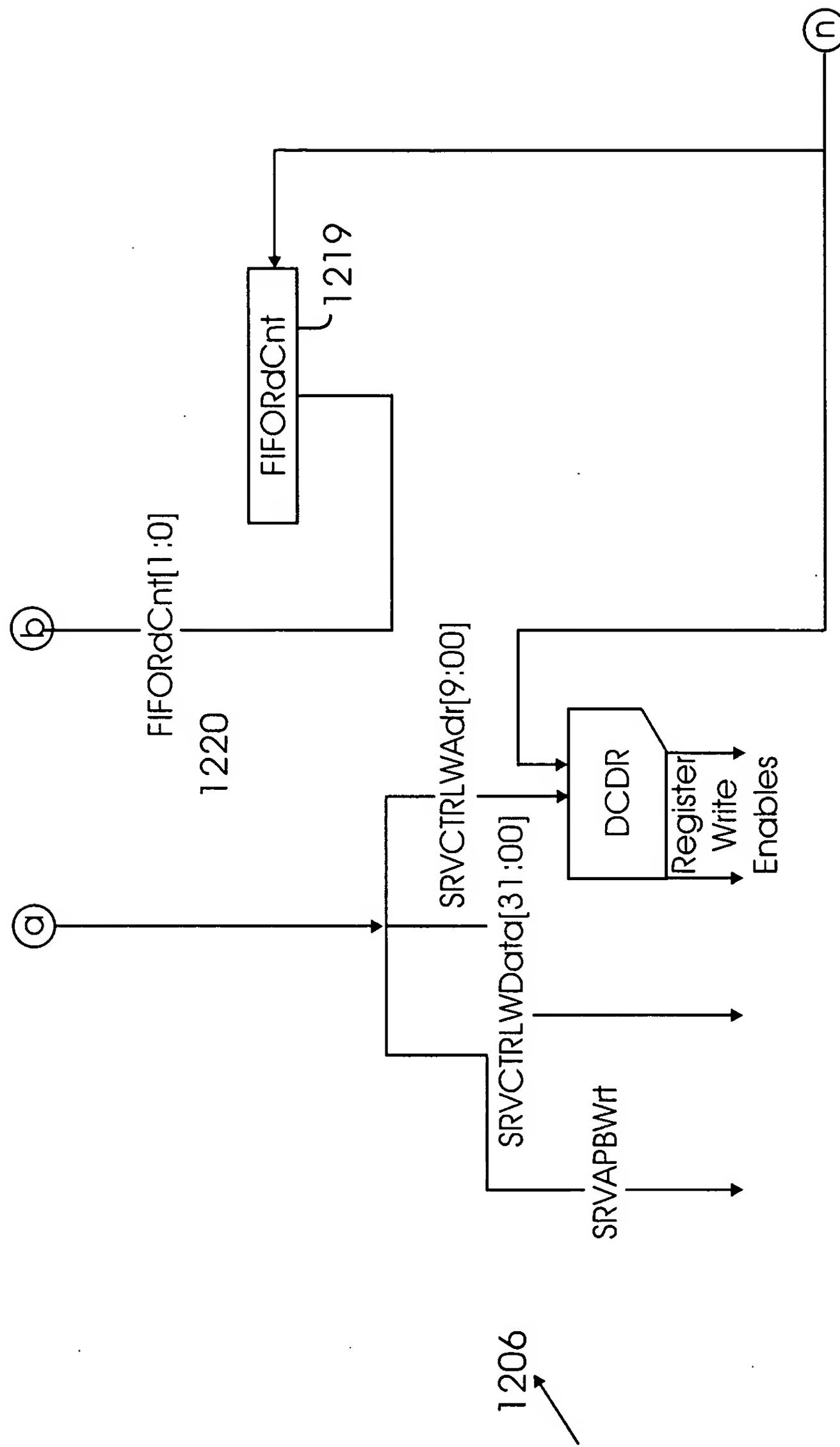


FIGURE 1 2C-(iii)

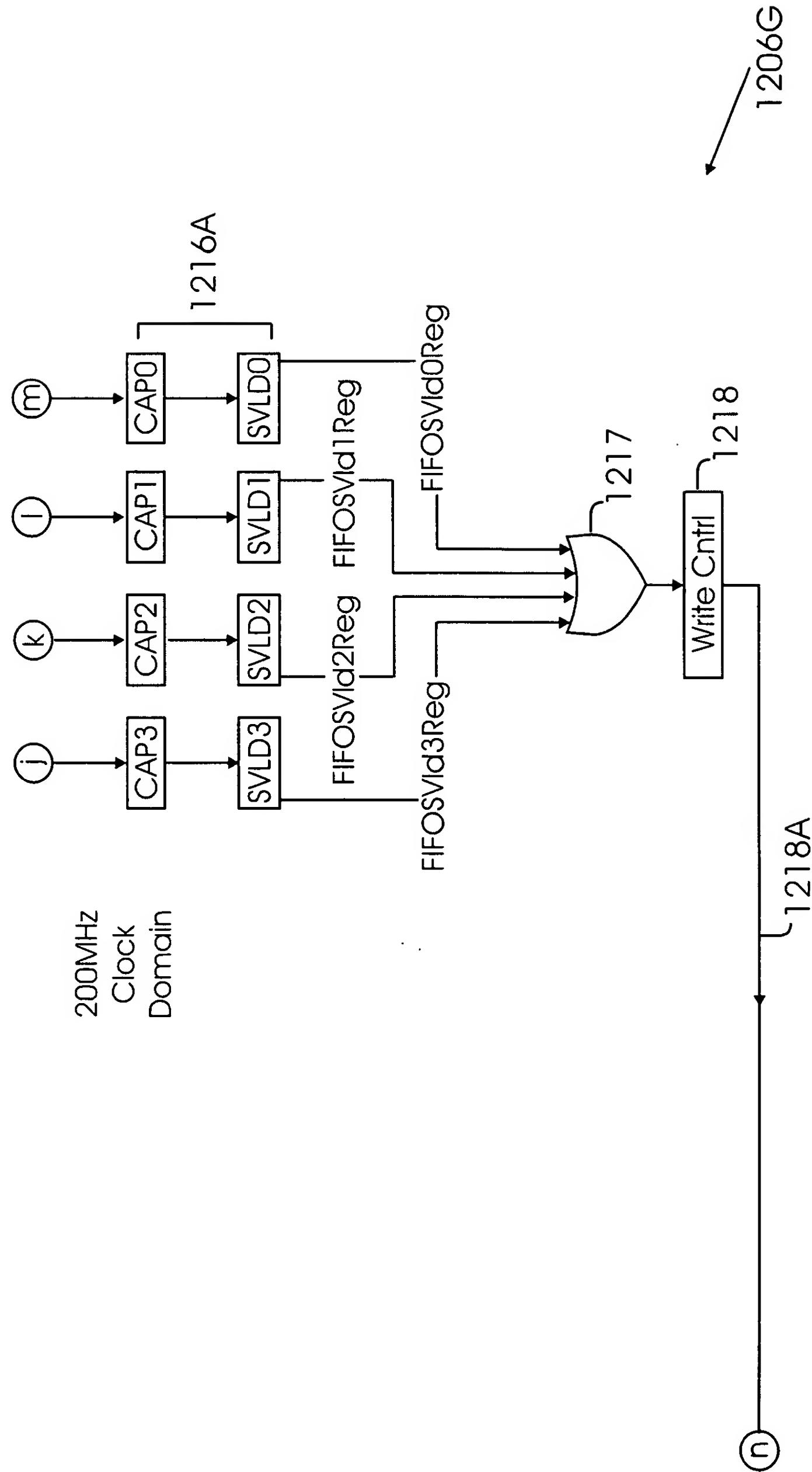
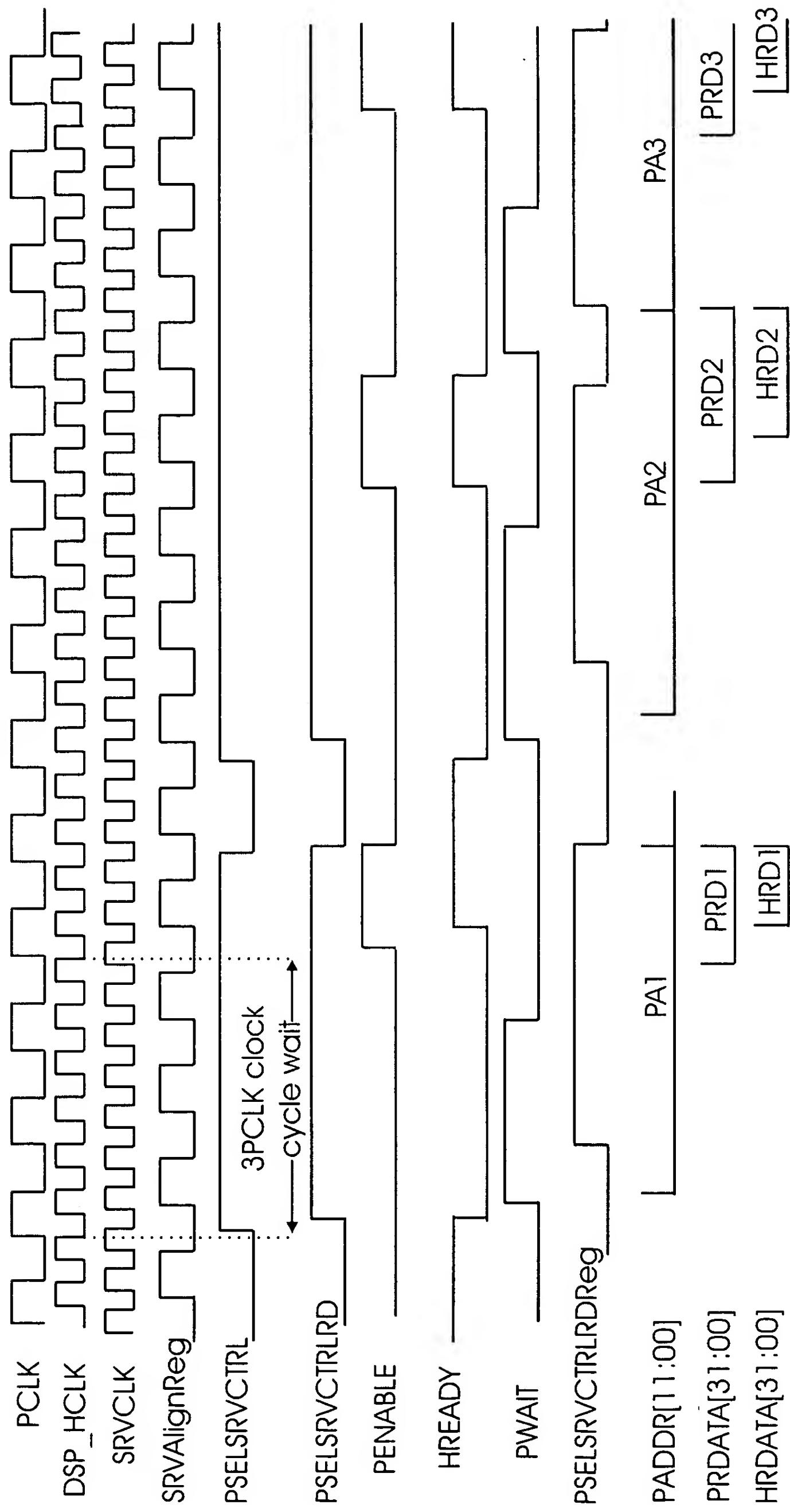
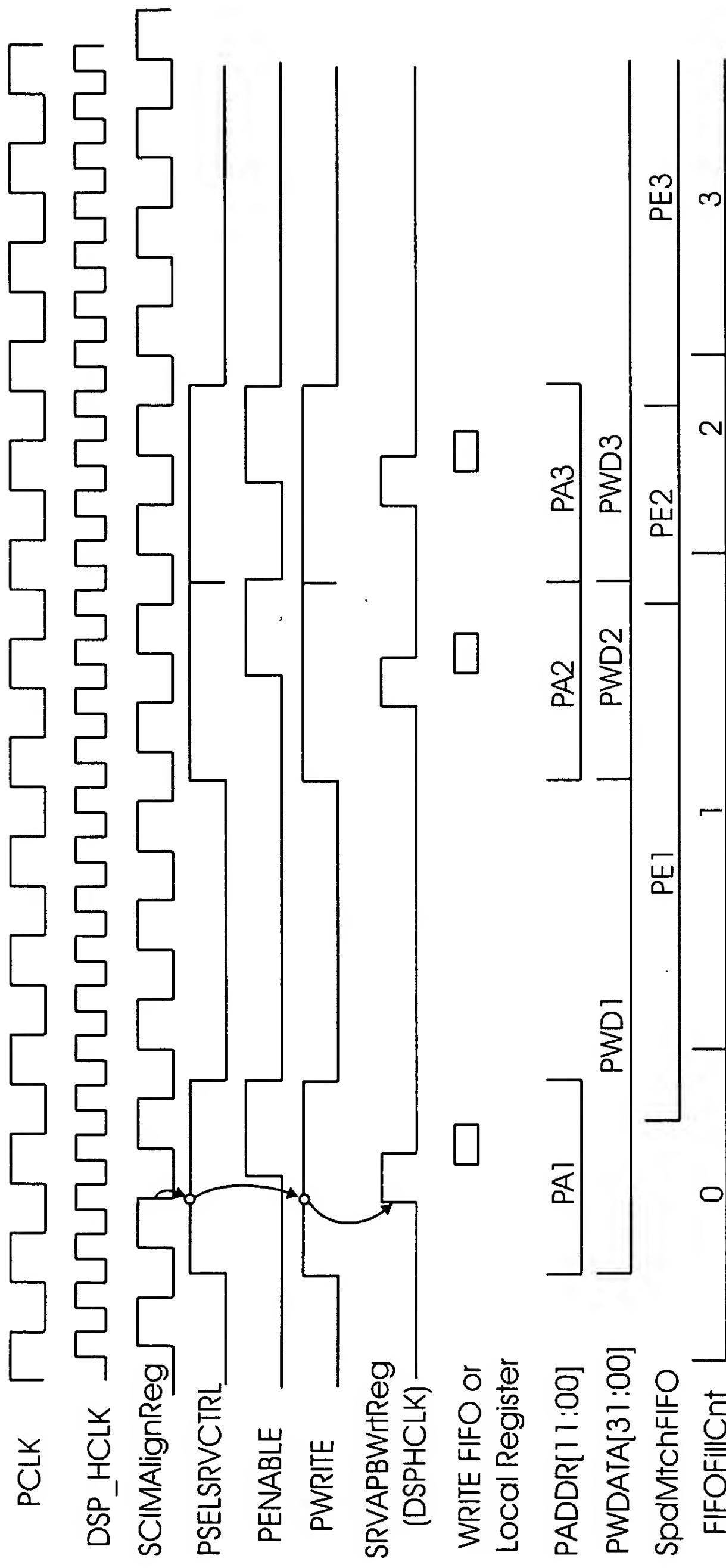


FIGURE 1 2C-(iv)



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FIGURE 13



NOTE:

1. SRVAPBWrData,data input to SRVAPBWrReg=PSEL_SRVCTRL & PWRITE & - PENABLE & SCIMAlignReg

FIGURE 14

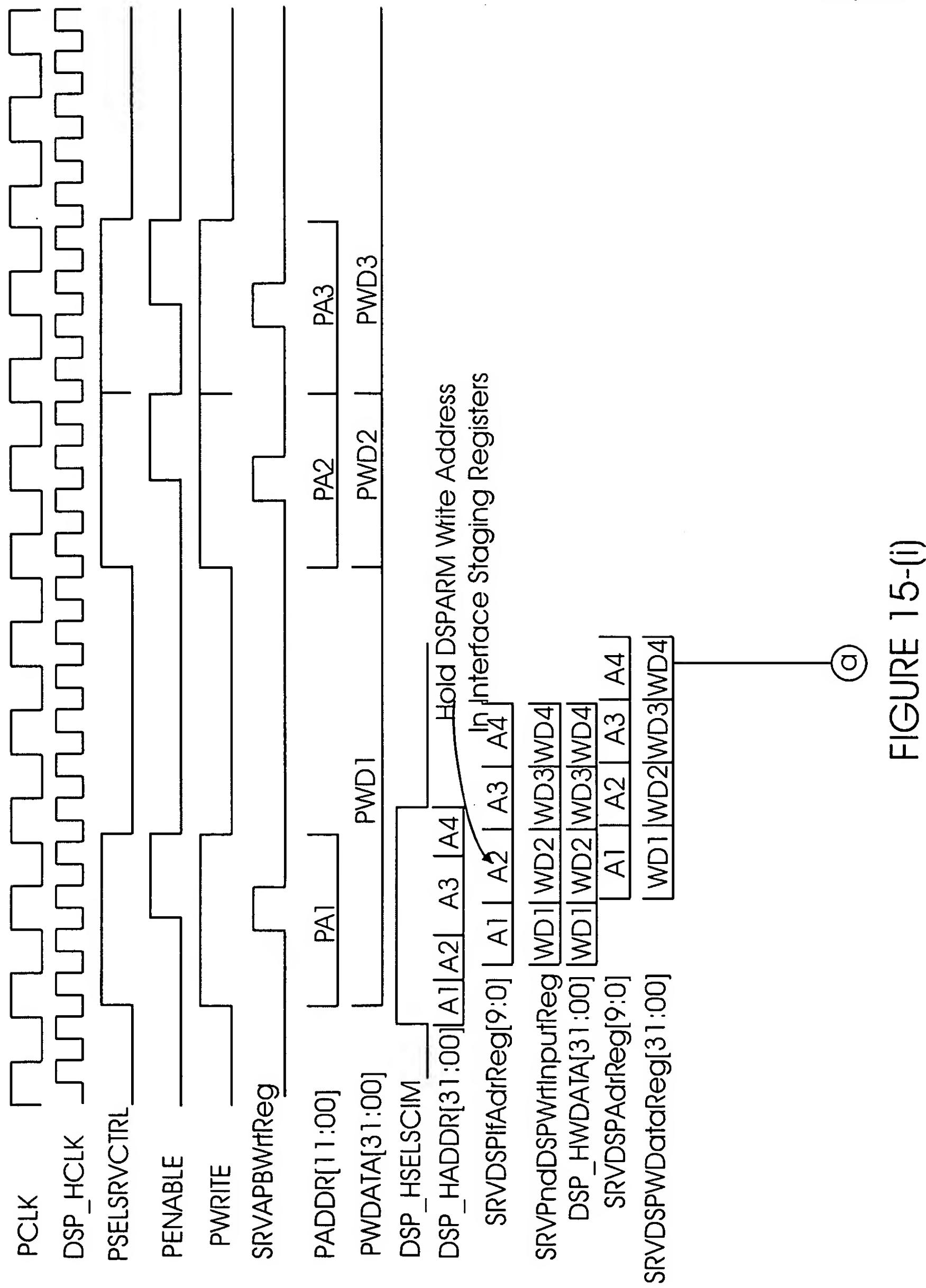
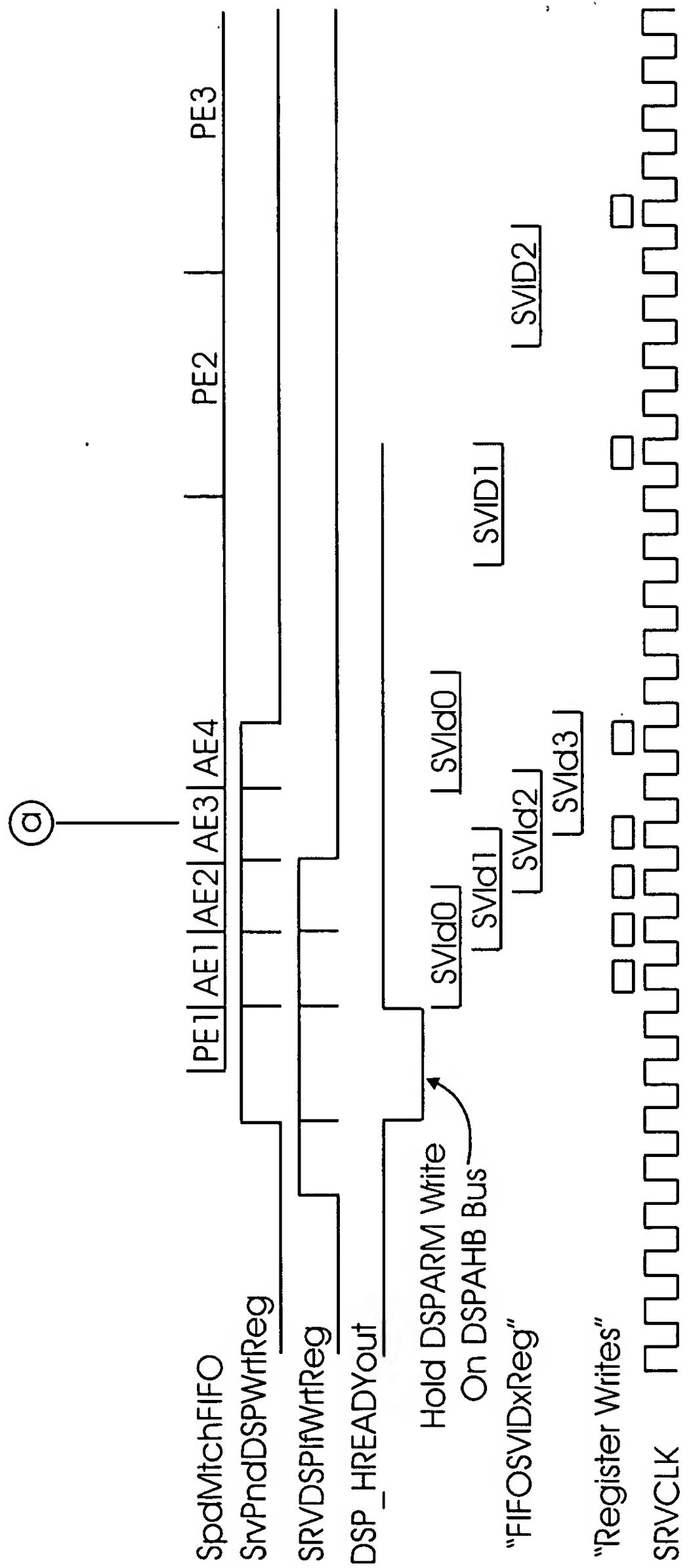


FIGURE 15-(i)



NOTES:

1. **DSP_HREADYOut**=**DSP_HWRITE & SRVPinDSPWtInputReg & SRVCTRL**
2. **SRVPinDSPWtInputReg**=**DSP_HSELSCIM & DSP_HREADYin & DSP_VallTrans & {"size or address error"}**
3. **SRVPinDSPWtReg** **_input**=**PSEL_SRRVCTRL & IPENABLE & PWRITE & SCIMAlignReg**
4. "Hold DSPARM Write"=**SRVPinDSPWtReg & SRVCTRL**

FIGURE 15-(ii)

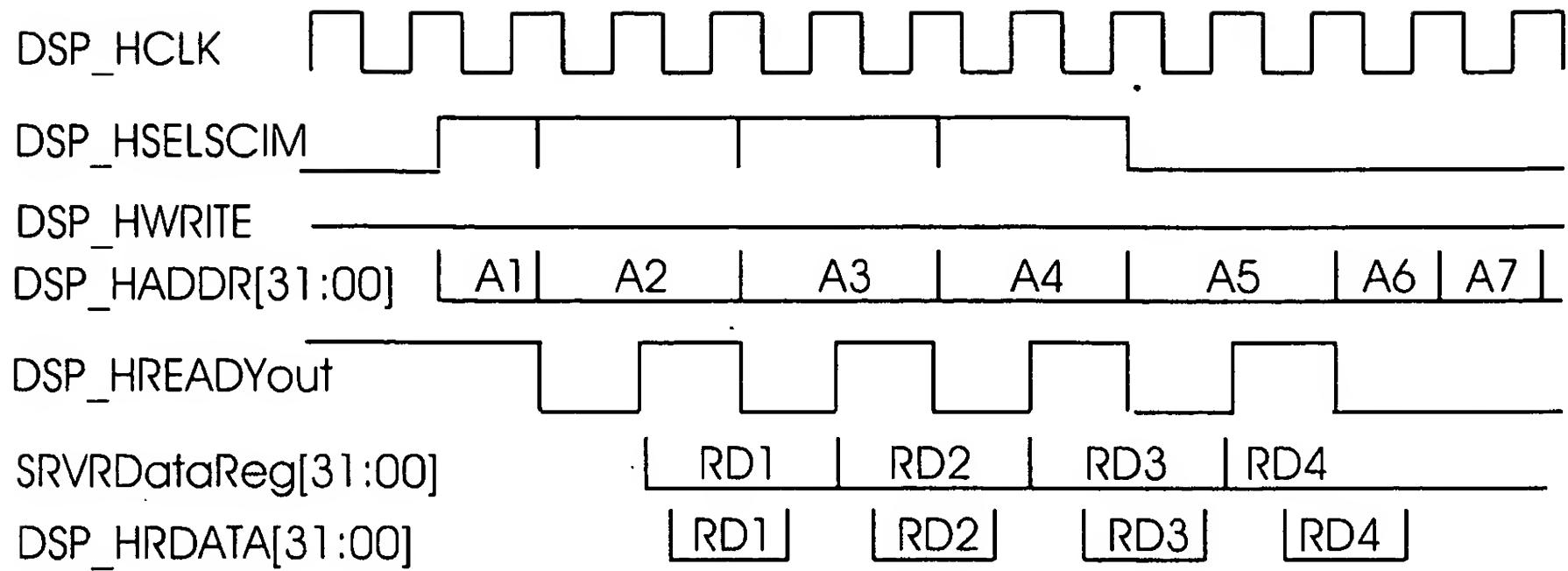


FIGURE 16

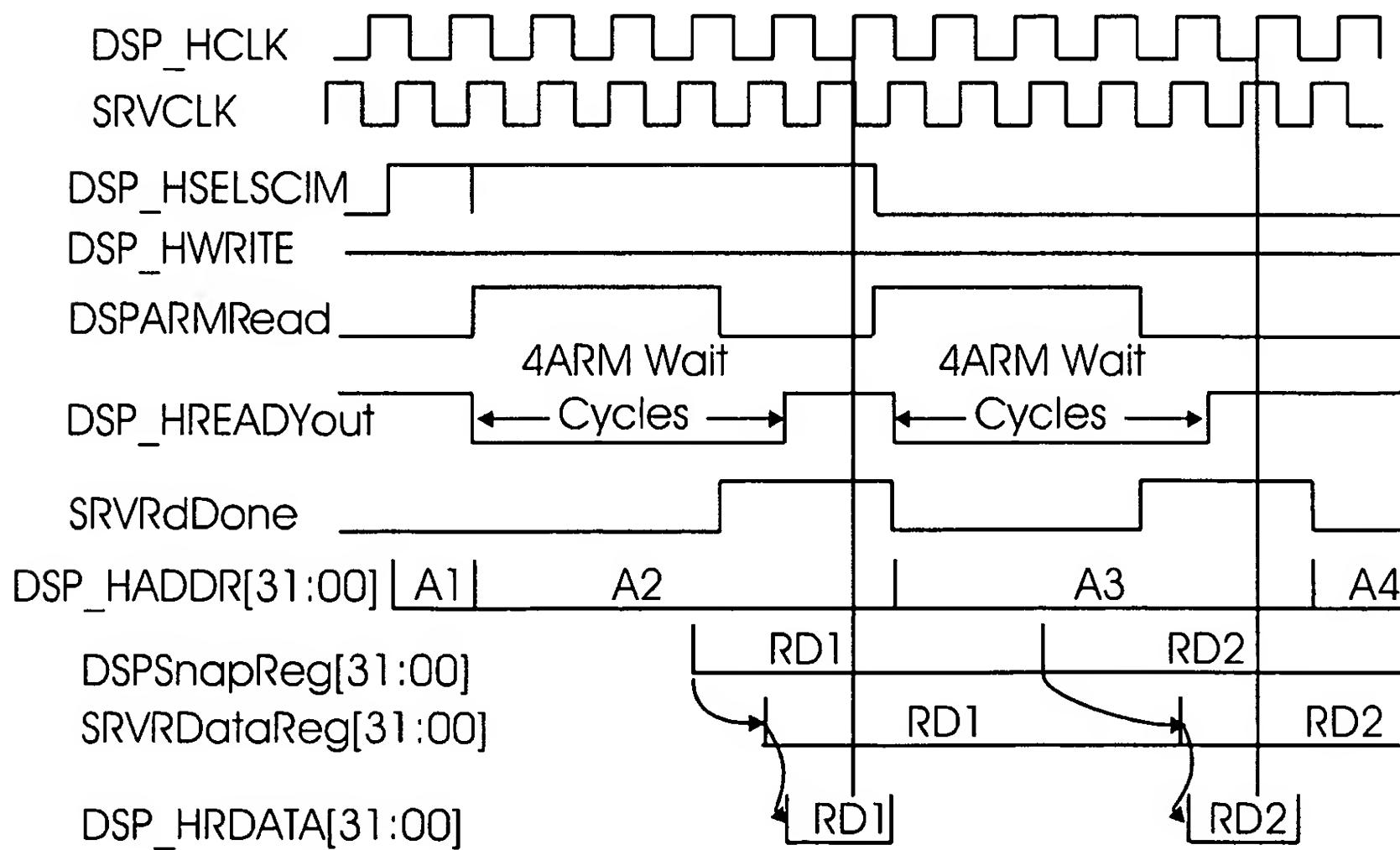


FIGURE 17

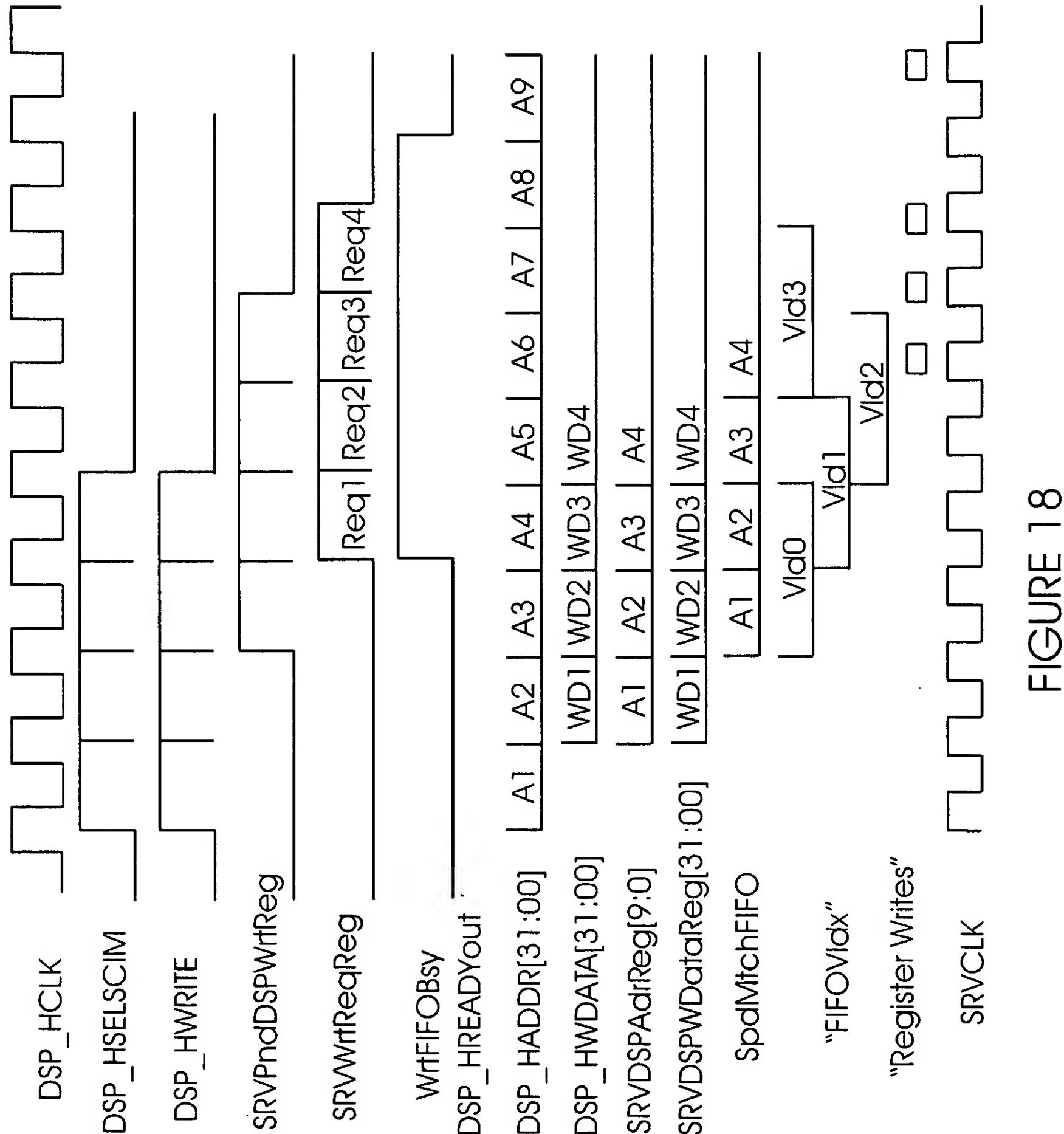


FIGURE 18

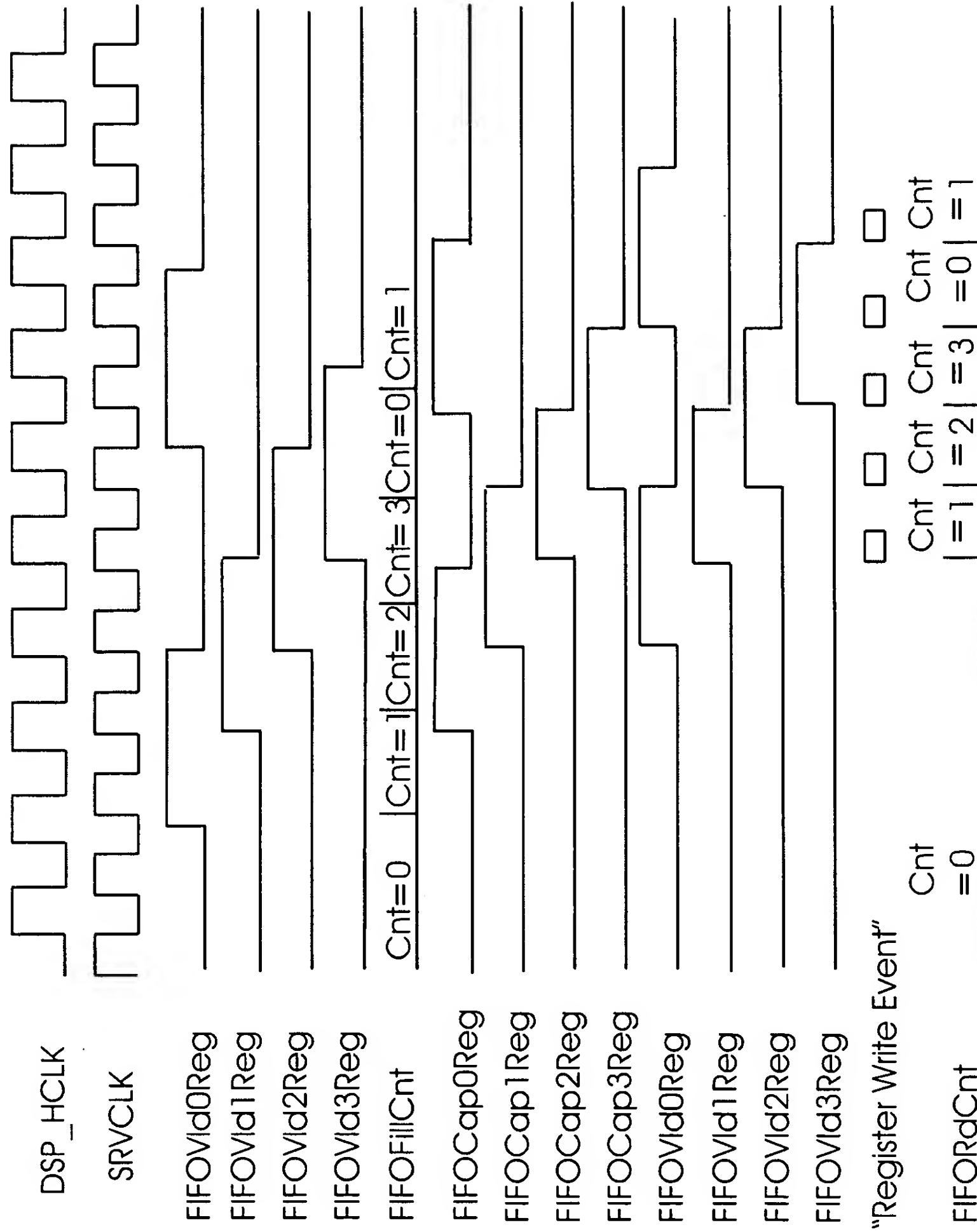


FIGURE 19

Conflict	APB 208	APB 208 Waits	DSPAHB Bus 233 Waits
	DSP 232		
Write	Write	No	Yes - 1 wait cycle
Read local register	NA	No	No
NA	Read local register	No	Yes - 1 DSP_HCLK clock cycle
Read Servo Controller register	NA	Yes - 1 PCLK clock cycle	No
NA	Read Servo Controller register	No	Yes - 3 DSP_HCLK clock cycles

FIGURE 20

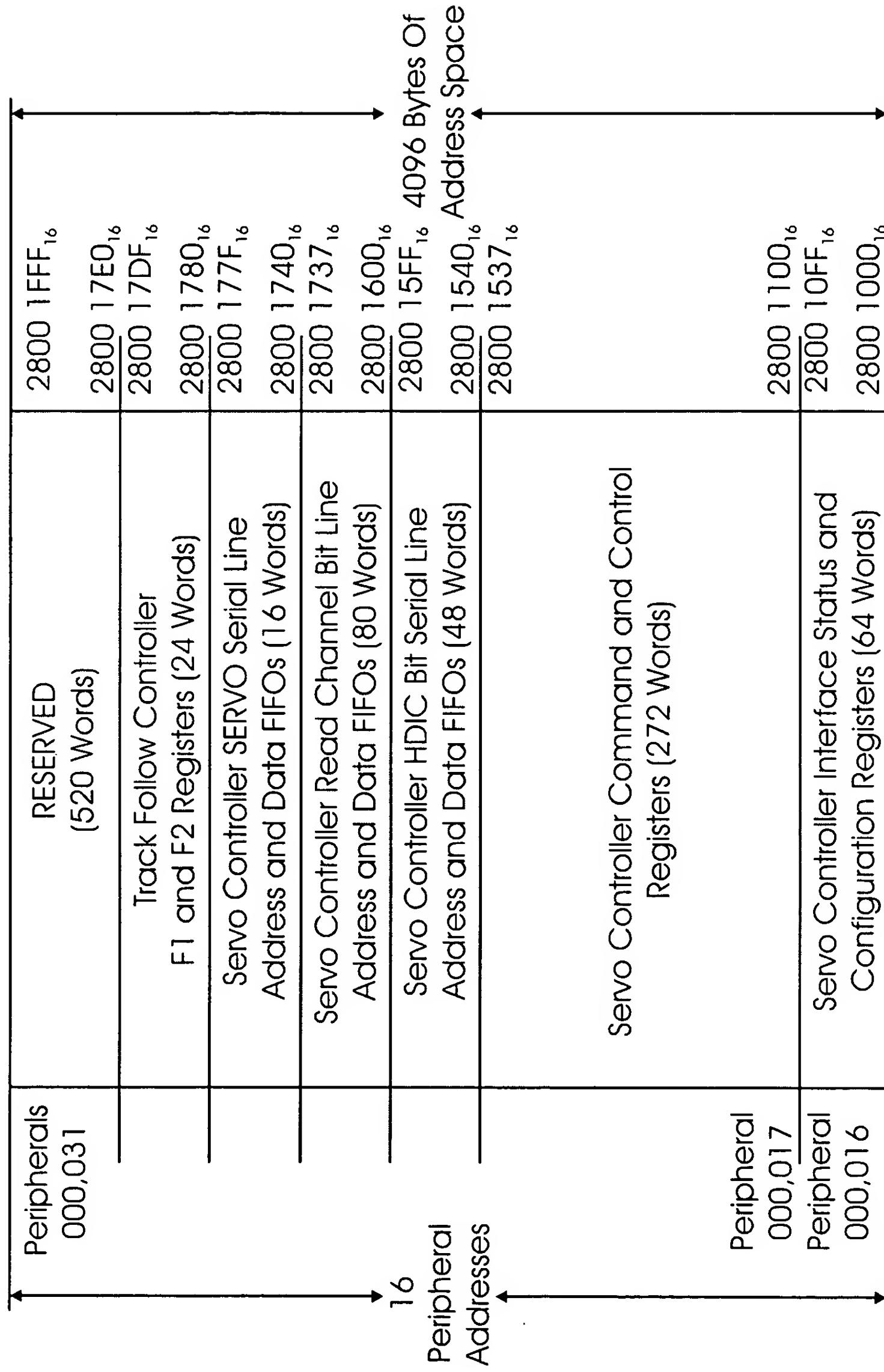


FIGURE 21

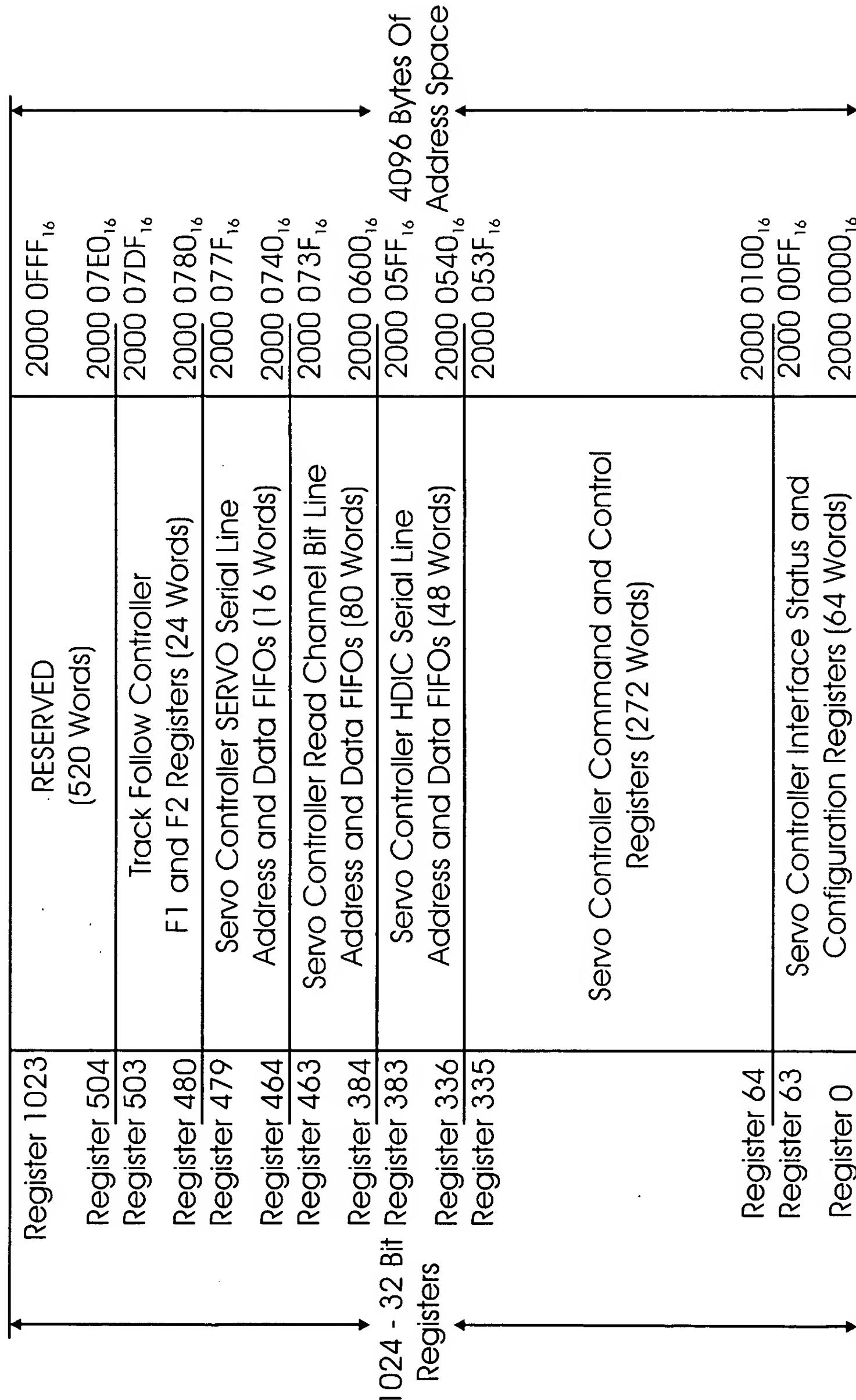


FIGURE 22

Bits	Function
[04]	SCIARMADCInt-SCI 211 sets (one clock cycle pulse) this bit when conversion data is available from ADCDAC 213 . Setting this bit generates a level sensitive interrupt (SRVCTRLARMINT) to Processor 240.
[03]	ARMWrtFIFOBSy - Write FIFOBSy signal bit indicates that a pending write is still in the Speed Matching write FIFO 1206
[02]	SCIARMSmphCflt - When SCI 211 sets this bit, it asserts the PADREXCPT signal to APB Bridge 235 indicating that Processor 240 attempted a register write (any register other than the SCISemaphoreReg or this register) when DSP 232 had ownership of the SCIHdwSmphr bit (hardware semaphore, SCISemaphoreReg[00]).
[01]	SCIADMAdrExcept - SCI 211 sets (one clock cycle pulse) this bit when an Address Exception is detected on Processor 240 access to SC 216 register.
[00]	SCIARMInt - SCI 211 generates a level sensitive interrupt (SRVCTRLARMINT) to Processor 240 when SC 216 asserts the hardware interrupt signal, SRVCARMINT.

FIGURE 23

Bits	Function
[31:04]	Reserved
[03]	DSPWrtFIFOBSy - Write FIFOBSy bit indicates that a pending write is still in the Speed Matching write FIFO 1206.
[02]	SCIDSPSmphCflt - When SCI 211 sets (one clock cycle pulse) this bit, when DSP 232 attempts a register write (any register except SCISemaphoreReg and this register) without having ownership of SCISemaphoreReg[00],the hardware semaphore bit SCIHdwSmphr. Setting this bit generates a level sensitive interrupt (SRVCTRLDSPINT) to the DSP Interface Module 210.
[01]	SCIDSPAdrExcept - SCI 216 sets (one clock cycle pulse) this bit when an Address Exception is detected on DSP 232 access to SC 216 . Setting this bit generates a level sensitive interrupt (SRVCTRLDSPINT) to DSP 232.
[00]	SCIDSPInt - SCI 211 generates a level sensitive interrupt (SRVCTRLDSPINT) to DSP 232 when SC 216 asserts the hardware interrupt signal, SRVCDSPINT.

FIGURE 24

Bits	Function
[31:04]	Reserved
[03:01]	SCISftSmphr[02:00] - SCI 211 Soft Semaphore that provide procedural interlocks only. These semaphores do not provide a hardware interlock (see description below).
[00]	SCIHdwdSmphr - SCI 211 Hardware Semaphore that provides a hardware interlock. When APB 208 acquires the semaphore the DSP 232 cannot execute a write access to any register in SC 216 or SCI 211 except the Semaphore Register or its respective status register. The reverse is true when DSP 232 owns this semaphore.

FIGURE 24A

BR Write Data	Alternate bus State	Current Bus State	Results	Comment
0	0	0	0	Write bit position=0,no action
0	1	0	0	Write bit position=0,no action
1	1	0	0	Attempt to acquire semaphore while the alternate bus has ownership
1	0	0	1	Attempt to acquire semaphore is successful
0	0	1	1	Write bit position=0,no action.Semaphore remains undisturbed
1	0	1	0	Clear semaphore operation

FIGURE 25

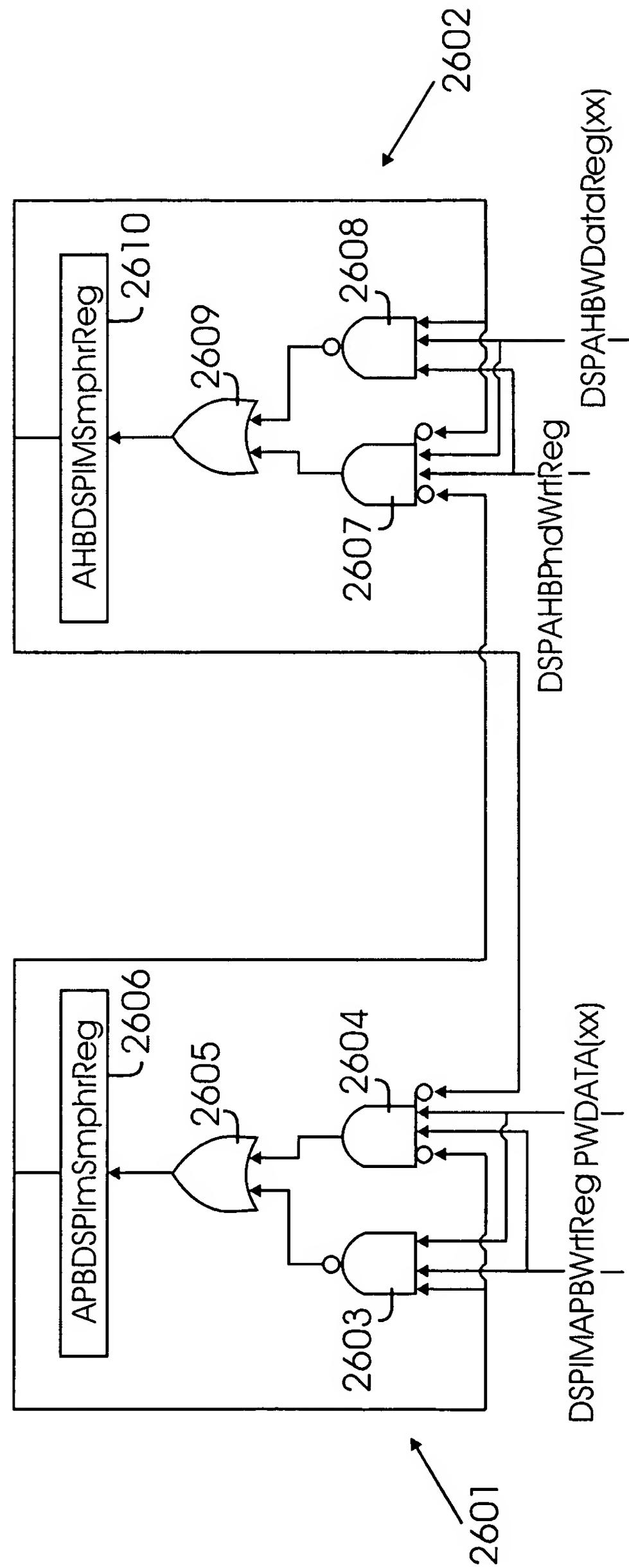


FIGURE 26

Bits	Function
[31:10]	Reserved
[09]	EnAddDSPWt - Enable Additional DSPARM Wait bit may be set (=1) to provide an additional DSP 232 wait cycle When reading a memory mapped register from SC 216. When this bit = 0 waits states on reads to SC 216 memory mapped registers = 3. When this bit = 1 waits states on reads to SC 216 memory mapped registers = 4.
[08]	EnDSPFrstADCCnvCmpltInt- Enable DSP 232 First ADC Conversion Complete Interrupt bit enables SCI 211 to send an interrupt (ADCCNVTDSPINT) to DSP 232 each time a conversion completes as the result of a Servo Frame (ADCFirstCnv) signal from SC 216
[07]	EnDSPADCCnvCmpltInt- Enable DSP 232 First ADC Conversion Complete Interrupt bit enables SCI 211 to send an interrupt (ADCCNVTDSPINT) to DSP 232 each time a conversion completes .
[06]	EnARMFirstADCCnvCmpltInt - Enable Processor 240 first ADC Conversion Complete Interrupt bit enables SCI 211 to send an interrupt (SRVCTRLARMINT) to Interrupt controller 207 each time a conversion completes as the result of a servo frame (ADCFirstCnv) signal from SC 216)
[05]	EnARMADCCnvCmpltInt - Enable Processor 240 ADC Conversion Complete Interrupt bit enables the SCI Controller Interface 211 to send a Processor 240 interrupt (SRVCTRLARMINT) signal Interrupt Controller 207 each time a conversion completes.
[04]	EnOnTrackSMVal - When this bit is set the Enable On Track Servo Machine values (DACval[9:0] are accepted each time a DAC Advance signal (DACAdvn) is sent rather than from the DAC FIFO values.
[03]	EnDSPPSDataInt- Enable DSP Position Data Interrupt enables SCI 211 to send interrupt SRVDSPARMPSDATAINT signal to DSP 232 each time SC 216 sends SRVPSDataInt.

(a) (b)

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©

FIGURE 27-(i)

(a)	(b)	(c)
[02]	EnSCIIDSPInt - Enables SCI 211 to generate an interrupt (SRVCTRLDSPARMINT) signal to DSP 232. When this bit = 0 it blocks all sources of interrupt generation. When this bit = 1 enable all sources to generate an interrupt.	
[01]	EnADCCnvsn - When this bit = 0 the ADC converter 213 is powered down and may not generate conversion data or interrupts.	
[00]	EnDSPIntrfc - Enable the DSPAHB Interface (DSPAHB Bus) bit may be set or cleared by APB 208.DSP 232 may clear this bit, but it cannot set this bit as it gains access to SCI 211 with MP 240 setting this bit. When this bit is set, DSP 232 has read/write access. When this bit is clear DSP 232 does not have write access to any registers except the SCIDSPStatusReg. An access attempted by DSP 232 without this bit set will result in an Address Exception interrupt being returned to DSP 232.	

FIGURE 27-(iii)

Servo Controller Interface MultiRate ADC Mask Register (SCIMultRtADCMskReg)	
Bits	Function
[31:07]	Reserved
[06:02]	ADC Mask bits specify the ADC 213 channel values that will be retained (1 mask bit for each channel) after a requested conversion with the exception of the conversion taken at SBD time (ADCFirstCnvt). All 5-channel conversion values are retained at SBD time (ADCFirstCnvt).
[01:00]	Multiple Rate Control - This two bit field specifies the number of valid DAC Multiple Rate FIFO entries. 00=Disabled, 01=1 X Multiple Rate, 10 = 2 X Multiple Rate, 11 = 4 X Multiple Rate.

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FIGURE 28

- Servo Controller Interface DAC MultiRate 0 Register (SCIDACMultRt0Reg)

Bits	Function
[09:00]	Entry 0 of the DAC Multi RateFIFO - This value is specified by either Processor 240 or DSP 232 for the first value provided to the DAC 213.

FIGURE 29

Servo Controller Interface DAC MultiRate 1 Register (SCIDACMultRt1Reg)

Bits	Function
[09:00]	Entry 1 of the DAC Multi RateFIFO - This value is specified by either Processor 240 or DSP 232 for the second value provided to the DAC 213 during a Multi Rate operation.

FIGURE 30

Servo Controller Interface DAC MultiRate 2 Register (SCIDACMultRt2Reg)

Bits	Function
[09:00]	Entry 2 of the DAC Multi RateFIFO - This value is specified by either Processor 240 or DSP 232 for the third value provided to the DAC during a Multi Rate operation.

FIGURE 31

Servo Controller Interface DAC MultiRate 3 Register (SCIIDACMultiRt3Reg)

Bits	Function
[09:00]	Entry 3 of the DAC Multi Rate FIFO - This value is specified by either Processor 240 or the DSP 232 for the third value provided to the DAC during a Multi Rate operation.

FIGURE 32

Servo Controller Interface ADC Channel 0 Register (SCIADCChn0Reg)

Bits	Function
[09:00]	Converted value from ADC channel 0 - This value is from a channel 0 conversion of an attached analog signal.

FIGURE 33

Servo Controller Interface ADC Channel 1 Register (SCIADCChn1Reg)

Bits	Function
[09:00]	Converted value from ADC channel 1 - This value is from a channel 1 conversion of an attached analog signal.

FIGURE 34

Servo Controller Interface ADC Channel 2 Register (SCIADCChn2Reg)

Bits	Function
[09:00]	Converted value from ADC channel 2 - This value is from a channel 2 conversion of an attached analog signal.

FIGURE 35

Servo Controller Interface ADC Channel 3 Register (SCIADCChn3Reg)

Bits	Function
[09:00]	Converted value from ADC channel 3 - This value is from a channel 3 conversion of an attached analog signal.

FIGURE 36

Servo Controller Interface ADC Channel 4 Register (SCIADCChn4Reg)

Bits	Function
[09:00]	Converted value from ADC channel 4 - This value is from a channel 4 conversion of an attached analog signal.

FIGURE 37

Servo Controller Interface Positioning Error Signal Data Array Registers

Bits	Function
[23:00]	Positioning Error Data - These 24 bits contain the Positioning Error Data value of each register array entry.

FIGURE 38